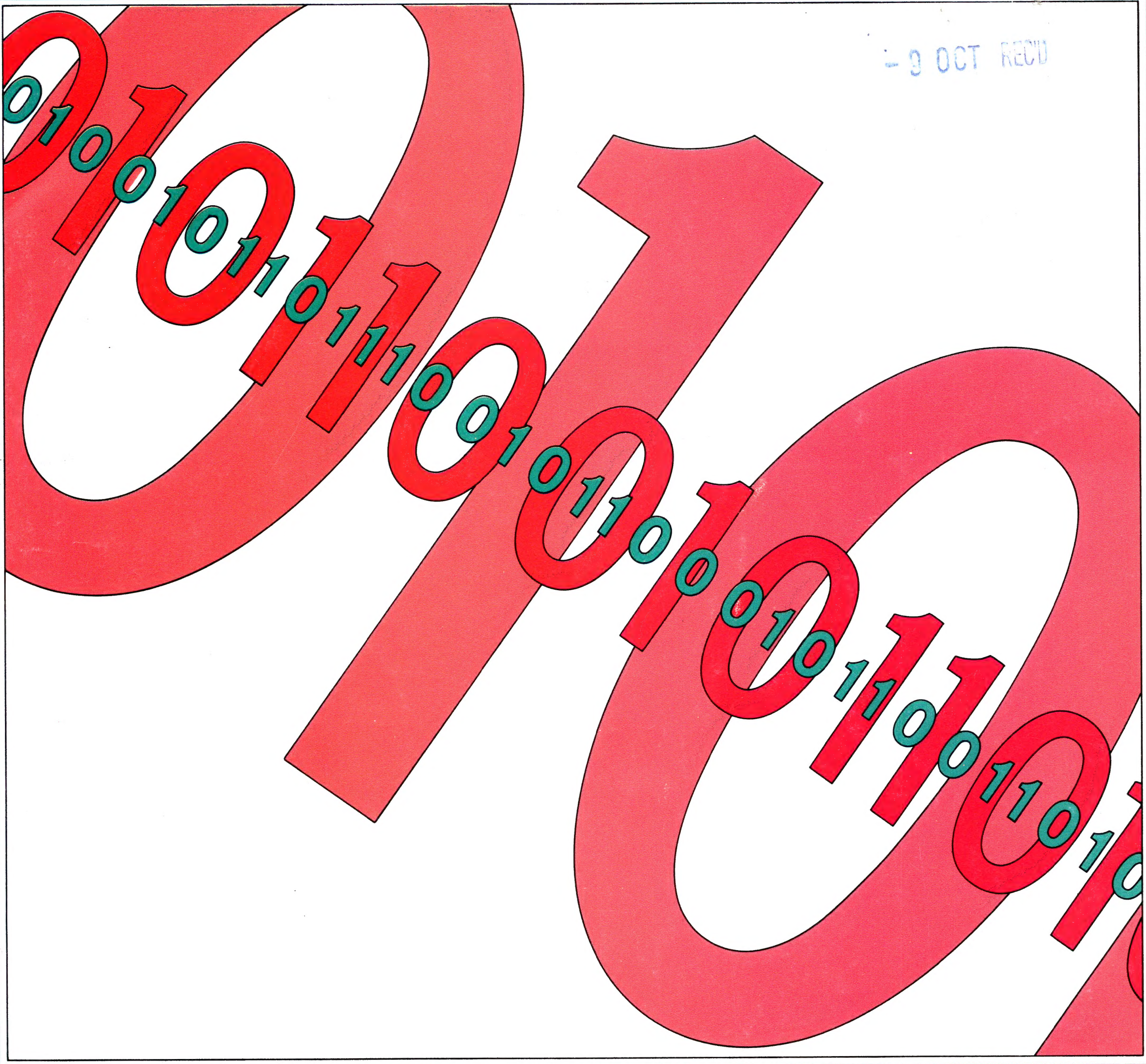
A McGRAW-HILL ELECTRONICS PUBLICATION SEPTEMBER 24, 1984 $3

ElectronicsWeek®

HBO set to scramble its signals

PIRACY WAR HEATS UP/19

UPDATE: INFORMATION TECHNOLOGY/57



- 9 OCT REC'D

Computer to keep damaged jet fighter aloft/29

Lexidata faces new battle after its president quits/53

Time-shared service speeds OEM gate-array turnaround and cuts cost/71

PROGRAMMABLE FILTER PER CHANNEL

PROGRAMMABLE GAIN PER CHANNEL

100KHZ THROUGHPUT

0.02% ACCURACY

AUTOMATIC CALIBRATION

AUTOMATIC DIAGNOSTICS W/O SOFTWARE

100V INPUT PROTECTION

16-BIT RESOLUTION

Now on Display . . . Series 600

The only state-of-the-art data acquisition system.

Compare Series 600 performance and features with any other system. You'll see why it represents the state of the data acquisition art.

With Series 600, you can take measurements at 100,000 samples per second with 16-bit resolution and with an accuracy of 0.02%. You can program input ranges from 0.65mV to 10.24V fullscale and program the cutoff frequency of each channel's active filter to 1Hz, 10Hz, 100Hz or 1kHz. And you can say goodbye to expensive and time-consuming manual calibration tasks; in Series 600, this function is automated.

Like all Neff products, Series 600 is backed by an extensive line of sophisticated computer interfaces and software drivers to fully support system performance.

Someday, other DAS suppliers may offer a high-speed system with some of Series 600's innovative features. But Series 600 is available now. For the full story, call or write for free brochure: **A New Concept in Data Acquisition.**

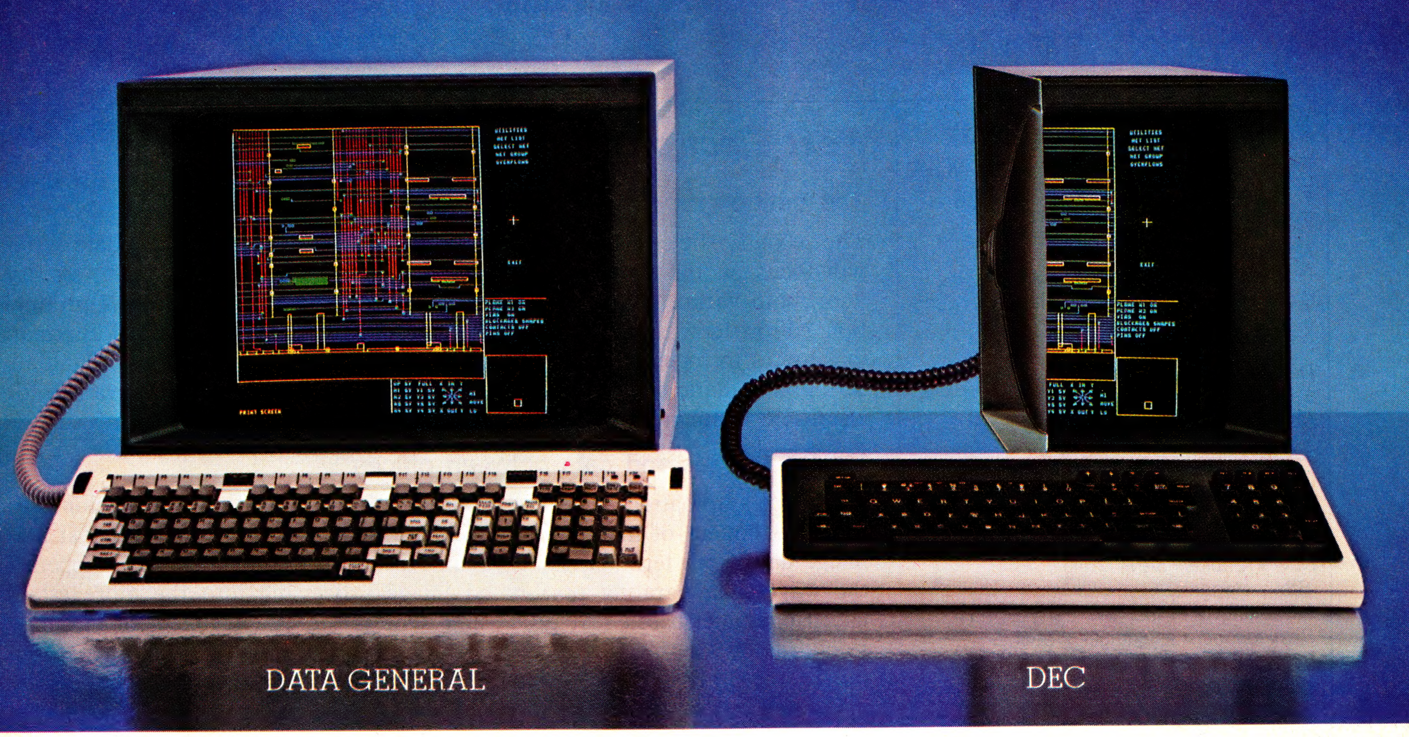
NEFF
INSTRUMENT CORPORATION

CORPORATE OFFICES
700 S. Myrtle Ave.
Monrovia, CA 91016
(800) 423-7151
In California (818) 357-2281
TWX: 910-585-1833

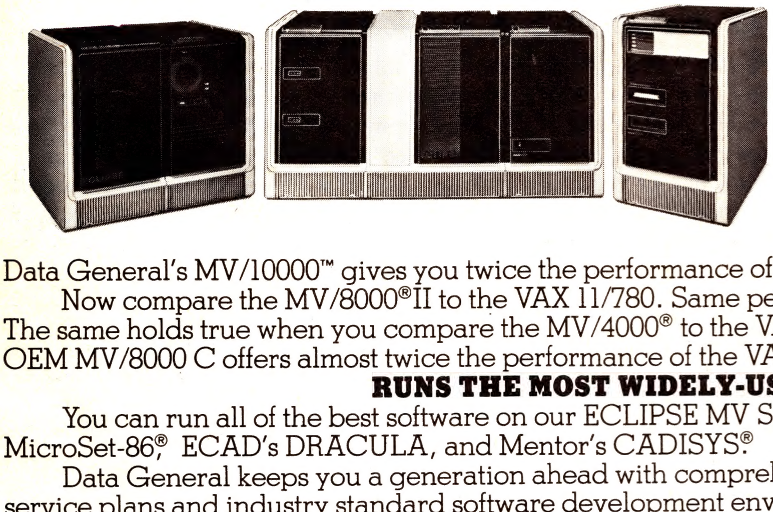
NEFF EUROPE
Hans-Pinsel Strasse 9-10
8013 Haar bei Munchen
West Germany
(089) 460-3999 TLX: 5212996

Circle 900 on reader service card

DATA GENERAL'S MV/10000. LESS MONEY THAN DEC'S VAX 11/780 AT TWICE THE SPEED.



DATA GENERAL'S MV/FAMILY–TOP PERFORMANCE, NOT TOP DOLLAR



Forget VAX.™

Data General's ECLIPSE® MV/Family of 32-bit computers brings you the best price/performance available for engineering applications—while running some of the best electronics engineering software.

TWICE AS FAST AS VAX

Consider the price/performance graph shown below. On the basis of dollar-per-MIP, Data General's MV/10000™ gives you twice the performance of the VAX 11/780—at a lower price.*

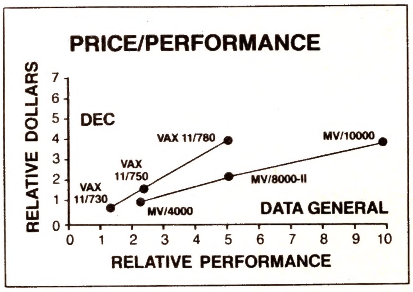
Now compare the MV/8000®II to the VAX 11/780. Same performance. But the MV/8000II is half the price. The same holds true when you compare the MV/4000® to the VAX 11/750. And our recently announced OEM MV/8000 C offers almost twice the performance of the VAX 11/750. But it's the same price.

RUNS THE MOST WIDELY-USED SOFTWARE

You can run all of the best software on our ECLIPSE MV Series, including TEGAS,™ NCA/DVS,™ MicroSet-86,® ECAD's DRACULA, and Mentor's CADISYS.®

Data General keeps you a generation ahead with comprehensive service plans and industry standard software development environments.

For further information, write Data General Corporation, M.S. F134, 4400 Computer Drive, Westboro, MA 01580.



*Compared to the VAX 11/785, our MV/10000 offers 40% better performance for two-thirds the price.

Copyright 1984 Data General Corporation, Westboro MA. ECLIPSE, ECLIPSE MV/4000 and ECLIPSE MV/8000 are registered trademarks, and ECLIPSE MV/10000 is a trademark of Data General. DEC and VAX are trademarks of Digital Equipment Corp. Prices based on Data General and DEC price lists and other publicly available information as of Jan. 1984. TEGAS is a trademark of Calma Co. MicroSet-86 is a registered trademark of First Systems Corp. CADISYS is a registered trademark of California Automatic Design.

Data General
a Generation ahead.

Circle 1 on reader service card

ElectronicsWeek

PREVIEWS

EDITOR IN CHIEF: George R. Davis

EXECUTIVE EDITOR, *technical:* Samuel Weber
EXECUTIVE EDITOR, *news:* Arthur Erikson
MANAGING EDITOR: Howard Wolff

SENIOR EDITORS:
Howard Bierman, Ray Connolly,
Tom Manuel, Kevin Smith, Jeremy Young

ART DIRECTOR: Fred Sklenar

DEPARTMENTS
Business: Robert J. Kozma
Communications & Microwave: Terry Feldt
Components: Michael Rand
Computers & Peripherals: Tom Manuel
Government/Military: Ray Connolly
Industrial & Consumer: David M. Weber
New Products: Steve Zollo, Steve Haggerty
Packaging & Production: Jerry Lyman
Semiconductors: Samuel Weber
Software & Microsystems: Jeremy Young
Systems Integration: Robert Rosenberg
Test & Measurement: Howard Bierman

NEWS EDITORS
Robert J. Kozma, Jesse J. Leaf, David M. Weber

EDITORIAL PRODUCTION
Charles D. Ciatto, *Manager,* June Noto, Jody LoGrasso, Kevin J. Powers

COPY DESK
Benjamin A. Mason, *Assistant Managing Editor,* Jay J. Iorio, Bill McIlvaine, Jim Taibi, Susan Levi Wallach

ART DEPARTMENT
Sachiko Inagaki, *Associate Director*
Kathleen Mulderrig, Annamaria Palma, *Art Assistants*

NEWS BUREAUS
Boston: Craig D. Rose
Chicago: Wesley R. Iversen
Dallas: J. Robert Lineback
Los Angeles: Larry Waller
New York: George Leopold
Palo Alto: Clifford Barney
Washington: Ray Connolly, Karen Berney
Frankfurt: John Gosch
London: Kevin Smith
Paris: Robert T. Gallagher
Tokyo: Charles L. Cohen, Michael Berger

ADMINISTRATIVE ASSISTANT: Kathleen Morgan
EDITORIAL ASSISTANT: Ann Jacobs
EDITORIAL SECRETARIES: Janice Jung, Josephine Ortiz, Millie Santos

PUBLISHER: Paul W. Reiss

Next ElectronicsWeek

The outlook for manufacturing technology

The second article in the *ElectronicsWeek* four-part technology update series will focus on the rapid changes that technology is bringing to the factory floor, both within and beyond the electronics industry. Packaging & production editor Jerry Lyman and test & measurement editor Howard Bierman join forces to focus on major developments in computer-integrated manufacturing, automatic test equipment, and packaging and production advances for electronic components and equipment.

Moving images and data between offices

The office-automation drive has progressed from dumb copying machines to the development of more sophisticated techniques for moving both text and image data from terminal to terminal. Now, two developments have opened the way for integrating pixel-based image processing into the more established character-based text processing. One is the establishment of facsimile standards by the International Telegraph and Telephone Consultative Committee; the other is the implementation of those standards on very large-scale integrated circuits that compress and expand the information. An article in the next issue of *ElectronicsWeek* will examine those techniques and spotlight the latest of the VLSI chips that have been designed to accomplish the job.

Looking ahead in ElectronicsWeek

Coming up is No. 3 in the four-part technology update series. It will provide an overview of the past year's activity in the fast-changing field of semiconductors, where, with memory designs topping the 1-million-device mark and microprocessors, peripherals, and interface circuits nearing 500,000 transistors per chip, one of the more pressing problems for manufacturers of those semiconductors is satisfying the apparently insatiable hunger on the part of their customers for increased functionality.

September 24, 1984 Volume 57, Number 24
112,922 copies of this issue printed

ElectronicsWeek (ISSN 0748-3252). Published weekly by McGraw-Hill, Inc. Founder: James H. McGraw 1860-1948. Publication office: 1221 Avenue of the Americas, N. Y., N. Y. 10020; second class postage paid at New York, New York and additional mailing offices. Postage paid at Montreal, P. Q. Registration Number 9034.

Executive, editorial, circulation and advertising addresses: ElectronicsWeek, McGraw-Hill Building, 1221 Avenue of the Americas, New York, N. Y. 10020. Telephone (212) 512-2000. Teletype 12-7960 TWX 710-581-4879. Cable address: MCGRAWHILLNEWYORK.

Subscriptions limited to professional persons with active responsibility in electronics technology. No subscriptions accepted without complete identification of subscriber name, title or job function, company or organization, and product manufactured or services performed. Based on information supplied, the publisher reserves the right to reject nonqualified requests. Subscription rates: the United States and possessions $32 one year, $55 two years, $76 three years; company addressed and company libraries $40 one year, $67 two years, $93 three years; Canada and Mexico $34 one year, $57 two years, $78 three years; Europe $50 one year, $85 two years, $125 three years; Japan, Israel and Brazil $85 one year, $140 two years, $200 three years; Australia and New Zealand $95 one year, $170 two years, $240 three years, including air freight; all other countries $50 one year, $85 two years, $125 three years. Limited quota of subscriptions available at higher-than-basic rate for persons allied to field served. Check with publisher for these rates. Single copies: $3.00. Please allow four to eight weeks for shipment.

Officers of McGraw-Hill Publications Company: President: John G. Wrede; Executive Vice Presidents: Paul F. McPherson, Operations; Walter D. Serwatka, Finance & Services. Senior Vice President-Editorial: Ralph R. Schulz. Senior Vice President Publishers: Harry L. Brown, David J. McGrath, James R. Pierce, Gene W. Simpson, John E. Slater. Vice President Publishers: Charlton H. Calhoun III, Richard H. Larsen, John W. Patten. Vice Presidents: Kemp Anderson, Business Systems Development; Shel F. Asen, Manufacturing; John A. Bunyan, Electronic Information Services; George R. Elsinger, Circulation; Michael K. Hehir, Controller; Eric B. Herr, Planning & Development; H. John Sweger Jr., Marketing; Virginia I. Williamson, Business Development.

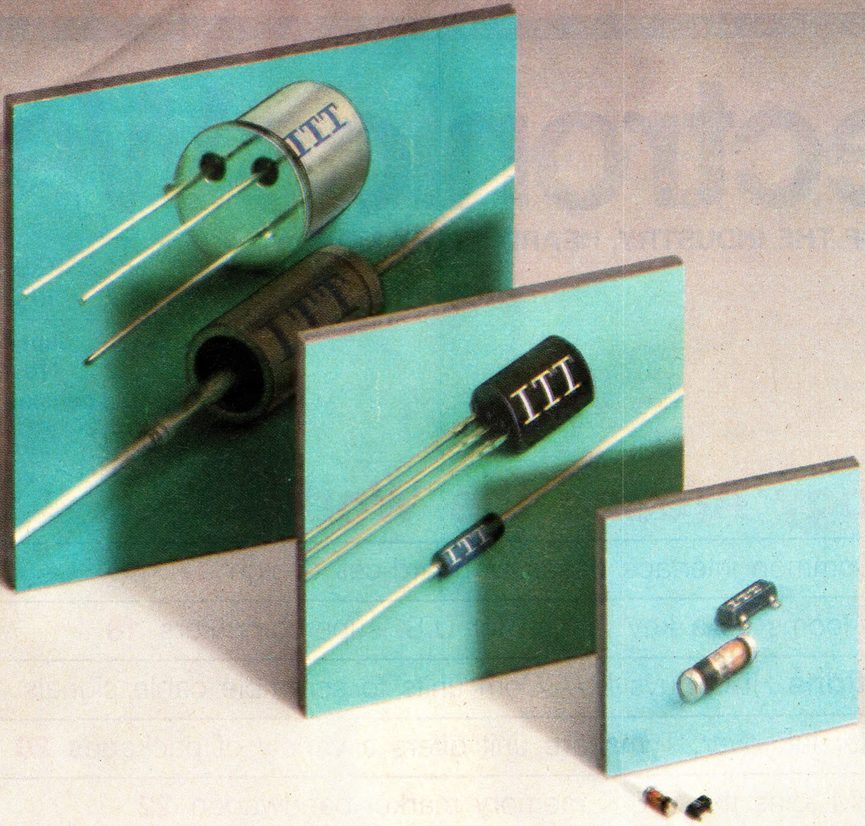
Officers of the Corporation: Harold W. McGraw Jr., Chairman; Joseph L. Dionne, President and Chief Executive Officer; Robert N. Landes, Senior Vice President and Secretary; Ralph J. Webb, Treasurer.

Title registered in U. S. Patent Office; Copyright 1984 by McGraw-Hill, Inc. All rights reserved. The contents of this publication may not be reproduced in whole or in part without the consent of copyright owner.

Where necessary, permission is granted by the copyright owner for libraries and others registered with the Copyright Clearance Center (CCC), 21 Congress Street, Salem, Mass. 01970, to photocopy any article herein for the base fee of $0.50 per copy of the article plus $0.25 per page. Payment should be sent directly to the CCC. Copying done for other than personal or internal reference use without the express permission of McGraw-Hill is prohibited. Requests for special permission or bulk orders should be addressed to the publisher. ISSN 0748-3252/84$0.50+.25.

Subscribers: The publisher, upon written request to our New York office from any subscriber, agrees to refund that part of the subscription price applying to copies not yet mailed. Please send change-of-address notices or complaints to Fulfillment Manager; subscription orders to Circulation Manager, ElectronicsWeek, at address below. Change-of-address notices should provide old as well as new address, including zip codes. Attach address label from recent issue. Allow one month for change to become effective. Subscriber Service: call (201) 356-7980, 9 a.m. to 4 p.m. EST. Postmaster: Please send Address Changes to Fulfillment Manager, ElectronicsWeek, CN 808, Martinsville, N. J. 08836.

Editorial department phones: Administration (212) 512-2645, News and New Products (212) 512-2685, Technology (212) 512-2666. Bureaus: Chicago (312) 751-3811, Dallas (214) 458-2400, Los Angeles (213) 480-5234, New York (212) 512-2975, San Francisco/Palo Alto (415) 968-2712, Washington (202) 463-1650, Frankfurt 72-5566, London 493-1451, Paris 720-2070, Tokyo 581-9816. **Business departments:** (212) 512-3469 (a full listing of Business departments follows the Advertisers' Index).



All aboard for better quality.

Surface Mounted Devices (SMDs) from ITT Semiconductors in MELF, MiniMELF and chip form bring you the benefits of surface mounting along with component quality you can count on.

ITT Semiconductors diodes come in a hermetically sealed MELF or MiniMELF glass package for greater protection against mechanical damage and environmental factors. It's not only more effective, it's cheaper, too.

All ITT Semiconductors SMDs can be supplied in Super-8 format tape packaging for use in high-speed placement systems. Or you can order loose components at even lower cost. Whatever you require, ITT Semiconductors guarantees full compatibility with all current soldering techniques.

As the world's leading diode manufacturer, ITT Semiconductors has injected decades of experience and expertise into a new and wide range of SMDs, available ex-stock through ITT Semiconductors dealers or direct:

- transistors
- universal diodes
- tuning diodes
- switching diodes
- band switching diodes
- Zener diodes
- Schottky diodes
- silicon oxide capacitors

Remember, with ITT Semiconductors on board, you're on the right course.

Production and Marketing Centers:
U.S.A.: ITT Semiconductors, 470 Broadway, Lawrence, MA 01841, Tel. (617) 688-1881, Telex 947413, TWX 710-342-1357
Japan: ITT Semiconductors, P.O. Box 21, Sumitomo Building, Shinjuku-ku, Tokyo 160-91, Tel. (03) 347 88 81-5, Telex 22 858
W. Germany: ITT INTERMETALL, Hans-Bunte-Strasse 19, P.O. Box 840, D-7800 Freiburg, Tel. (0761) 5170, Telex 07-72715

ITT
Semiconductors

Circle 2 on reader service card

A McGRAW-HILL ELECTRONICS PUBLICATION

ElectronicsWeek

THE VOICE OF THE INDUSTRY, HEARD EVERY MONDAY

R&D BOOM IN JAPAN

Japanese up research spending 15.7%/32

Technology Around the World

Standards Common interface eases standard-cell design **17**

Trade Japan looms as a key market for U.S. supercomputers **18**

Communications HBO buys M/A-Com units to scramble cable signals **19**

Software After takeover, Tymshare unit offers a variety of packages **20**

Memories IBM joins the 256-K memory market bandwagon **22**

Displays Beam-indexed picture tube shines for projection TV **24**

Semiconductors Silicided word lines speed up megabit EPROM **25**

Chronology of a megabit EPROM **28**

Text Processing LSI optically segments page **28**

Cellular Radio Chip set foils eavesdroppers **29**

Production Board maker links to work stations **29**

Avionics Air Force seeks control system that keeps damaged plane flying **30**

Research and Development Japanese firms boost spending for R&D **32**

Government U.S electronics firms pushing White House to free up trade **36**

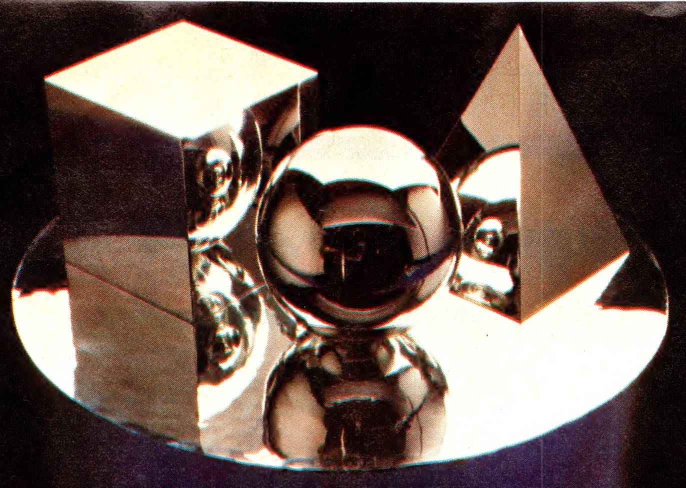
Packaging Single in-line package sheds its leads **36**

Computers Data General raises stakes with full-screen portable computer **38**

Briefs AT&T's new fiber, Smart cards, Rovsing sell-off, Future of AI **40**

People Bruce A. Angwin to get show on the road.
Rolf Deubert leads ITT Semiconductor's
push into consumer signal processing **48**

Companies Lexidata girds for new battle after CEO quits.
Semispecialists dream becoming a reality **53**



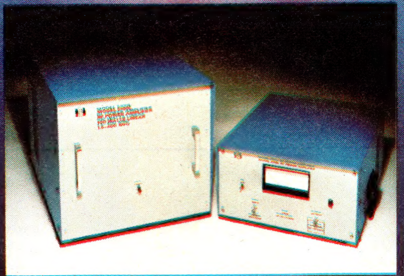
Wherever you need 100 Watts of RF power from 10kHz to 400MHz...

ENI has it covered.

Imagine the tremendous versatility you could enjoy with the extremely wide coverage of just these two broadband power amplifiers.

The ENI 5100L spans the frequency range of 1.5 to 400 MHz with a Class A linear output rating of 100 Watts and a flat 50 dB gain. And it will deliver 200 Watts from 1.5 to 200 MHz.

The ENI 2100L covers the range from 10 kHz to 12 MHz with a Class A linear output of more than 100 Watts. And it, too, can deliver 200 Watts over much of its useful frequency range.



Both units are solid state. Both units are unbelievably rugged. Unconditionally stable. Will not oscillate for any conditions of load or source impedance. And will withstand all mismatched loads including short and open circuits.

Now there's no need to buy a whole expensive spread of individual units. With just these two portable amplifiers, you can work on an almost infinite range of applications. If it's 100 Watts . . . ENI has it covered!

For more information, a demonstration, or a full line catalog, please contact us at ENI, 3000 Winton Road South, Rochester, NY 14623. Call 716/473-6900, or telex 97-8283 ENI ROC.

ENI

The advanced design line of RF power amplifiers

Circle 4 on reader service card

ENI products available through ENI Power Systems, Ltd., 23 Old Park Road, Hitchin, Hertfordshire, England SG52JS, Tel: Hitchin 51711, TELEX 825153 ENI UK G. And: **AUSTRALIA:** Elmeasco Instruments Pty. Ltd., Concord N.S.W. Australia, Tel: 939-7944 **BELGIUM:** MCR Electronics Marketing, 1420 Braine L'Alleud, Belgium, Tel: 02/384.80.62 **DENMARK:** Instrutek, 8700 Horsens, Tel: 05-611100 **EGYPT:** Electronic Precision Instrument Co., P.O. Box 1262, Cairo, Arab Republic of Egypt, Tel: 860819 **FRANCE:** Comsatec, 92300 Levallois-Perret, France, Tel: 758.59.10 **GERMANY, AUSTRIA:** Kontron Elektronik GmbH, 8057 Eching/Munich 1, Germany, Tel: 89-3188-1 **ISRAEL:** RDT Electronics Engineering Ltd., Tel Aviv 61210, Israel, Tel: 483211-5 **ITALY:** Vianello S.p.A., I-20121 Milano, Italy, Tel: 34.52.071 **JAPAN:** Astech Corporation, Shinjuku-ku, Tokyo 160, Japan, Tel: Tokyo 343-0601 **NETHERLANDS:** Koning en Hartman Elektrotechniek B.V., The Hague 2040, Netherlands, Tel: 70-678380 **SOUTH AFRICA:** Associated Electronics (Pty.), Ltd., Johannesburg, South Africa, Tel: 724-5396 **SWEDEN:** Saven AB, S-18500 Vaxholm, Sweden, Tel: 0764/31580 **SWITZERLAND:** Kontron Electronic AG, 8048 Zurich, Switzerland, Tel: 01 62 82 82 **UNITED KINGDOM:** Dale Electronics, Ltd., Frimley Green, Camberley, Surrey, England, Tel: Deepcut (02516) 5094

VOLUME 57, NO. 24 SEPTEMBER 24, 1984

ElectronicsWeek

Special Technology Reports

Technology Update: Information Processing Developments in computers, data storage, and communications abound as forces gather momentum to drive these once-distinct technologies together 57

Computers Computers of all types increase performance; fifth-generation machines and supercomputers hottest 58

Microprocessors 32-bit engines and new buses herald a new generation of powerful desktop computers 60

Data Storage The old data-storage frontiers crumble before new mass-storage technology 62

Communications Advances in fiber optics, ICs will speed communications among coming multilingual office and factory equipment 64

Gate Arrays Role of OEM in array design starts with XT. Gate-array design at original-equipment manufacturer starts on an IBM PC XT and uses superminicomputer at silicon foundry to massage net list 71

The case for gate arrays 72

New Products

Microsystems 32-bit systems suit a variety of applications 77

Components PWM FET switches noiselessly at 120 kHz 82

Microprocessors Processor combines 8-bit bus with 32-bit architecture 92

Speech Synthesizers Software lets Macintosh speak its mind 95

Features

Departments Previews 2 Up Front 8 ElectronicsWeek Index 43

New Literature 96 Meetings 98 Editorial 100

Renoir
LE DÉJEUNER
DES CANOTIERS

The Phillips Collection, Washington

Applied Microsystems Corporation:
Changing your ideas about emulation.

MYTH
3

ALL IN-CIRCUIT EMULATORS NEED A HOST

If you walk into your engineering department and see a group gathered around the development system or computer it's either because they are planning your surprise birthday party, or that they're simply waiting to log-on.

That's why it's so important that in-circuit emulators have the capability to accept software developed on a host system and then function as a stand-alone instrument. This allows you to *disconnect* from the host to debug software and integrate it with hardware, leaving the host system free for other development tasks. Which means better utilization of manpower and computerpower, and more time for birthday parties (or ''product released on time'' parties).

OUR EMULATORS INVITE MORE USERS.

Because in-circuit emulators from Applied Microsystems have stand-alone capabilities they can be used for more than just new product development.

Hand one over to the manufacturing test department and see how delighted those engineers are to find out they can use existing test routines.

Or if you're jumping from one type of microprocessor-based project to another you won't have to learn an entirely new system. We offer real-time emulation capability for Intel, Motorola, National and Zilog 8-bit and 16-bit microprocessor families.

It makes more sense to add another emulator when you add more staff to your department, rather than another computer workstation or MDS.

DON'T KEEP YOUR ENGINEERS WAITING.

Free-up your traditional development tools by taking advantage of stand-alone in-circuit emulation from Applied Microsystems Corporation. Contact us at:

A.M. Kirchenhölzl 14
8032 Gräfelfing
West Germany
c/o Steve Thatcher
Telefon 49-89-854-3290
Telex 841-5242/INSTR

Stand alone
in-circuit emulation
for 8-bit and 16-bit microprocessors

Applied Microsystems
CORPORATION

Circle 6 on reader service card

UP FRONT

U.S. semiconductor book-to-bill ratio reaches parity in August

The closely watched book-to-bill ratio for the U.S. semiconductor market continued its slide in August, reaching the 1:1 level, where orders balanced shipments. Though its downward course since January, from a 1.53:1 ratio, worries investors and some firms, the positive side is that shipments climbed to a record $1.045 billion for the month, according to the Semiconductor Industry Association, which tracks the sales results. SIA officials predict a resurgence from the customary summer sales lull, to a book-to-bill ratio in the 1.2:1 range in September and October.

Texas Instruments nearly half finished with review of military-chip tests

Texas Instruments Inc. is almost halfway through the process of clearing thousands of military chips for shipment after it was discovered many may have not been fully tested [*ElectronicsWeek,* Sept. 17, 1984, p. 24]. TI's first list of over 2,000 reviewed part types, distributed early last week, showed that tests run on less than 10% had fallen short of military system specifications. TI officials decline to estimate whether that percentage will hold firm over the entire list of 4,700 suspected parts. A second list that breaks out cleared components from those with incomplete tests will be distributed by the Department of Defense this week. To clear chips for shipment, TI is comparing test results against required testing programs on huge computer sheets. Those not matching specifications must undergo additional review between TI and its military system customers.

MCC to hike initiation fee for new members to $1 million

Expecting its corporate membership to exceed 20 by the end of the year, Microelectronics and Computer Technology Corp., Austin, will double the initiation fee for new companies to $1 million on Jan. 1, 1985. (The price of one share of MCC stock, as it is called, was $150,000 when the consortium was formed late in 1982.) Members are also required to jointly sponsor at least one research program for three years. The higher fee—approved by the MCC board in September—is evidence of growing confidence in the staff being assembled in central Texas, says chairman B.R. Inman. MCC has a payroll of over 200.

New memory array promises advanced features for digital TV

NEC Corp., Tokyo, will soon start to market field and frame stores that could provide advanced signal processing in digital television at a low price. The firm has developed a memory array, fabricated by standard dynamic random-access-memory technology, that can store a single television field bit by bit. The memory, which is suitable for use in receivers conforming to either the NTSC or the European standard, is organized as 320 rows by 700 columns, but any smaller number of rows or columns may be selected to match the application. Because rows and columns both use serial addressing, the chip can be offered in a 14-pin dual in-line package at a low price—which should be about the same as standard 256-K DRAMs in volume quantities. Addressing scheme and asynchronous refresh design allow systems to be designed with a minimum of support circuits. NEC says sales are scheduled to start in November. By early next spring the firm expects to be shipping 200,000 units a month.

Hold Everything!

EDA Is Here.

Fully integrated Engineering Design Automation is an idea whose time *has* arrived. And you want to purchase compatible CAD, CAM, and CAE systems to completely automate your product design cycle. *But,* with a host of software and hardware vendors offering a bewildering array of system choices, you may be missing the *key factor* in implementing EDA.

Just What Is EDA?

Simple: interconnected, integrated workstations that automate conceptual design, physical design, and the related manufacturing processes for systems-level electronic products.

What Is the Key Factor?

You've got to choose a company that truly *understands* your expectations. For instance, at Telesis, we're sure you want to link engineering design capture and CAD. We also know you need an open system with a general purpose CPU, so you can choose applications software freely and access both your local design database and the databases of your company's main computer. You should expect multiple functions: design, documentation, project management, communications, and more! And, of course, you want your system to be fast, easy-to-use, and inexpensive.

Wouldn't it be nice if you could get all of this from one company? You bet it would!

End Your Confusion.

You no longer face the bewildering choice of disconnected "opportunities"...and the arduous task of integrating them yourself. We're ready to provide our 300 customers with open-system solutions and proven software for the key functions of the design cycle: from design capture, through layout, to mechanical design.

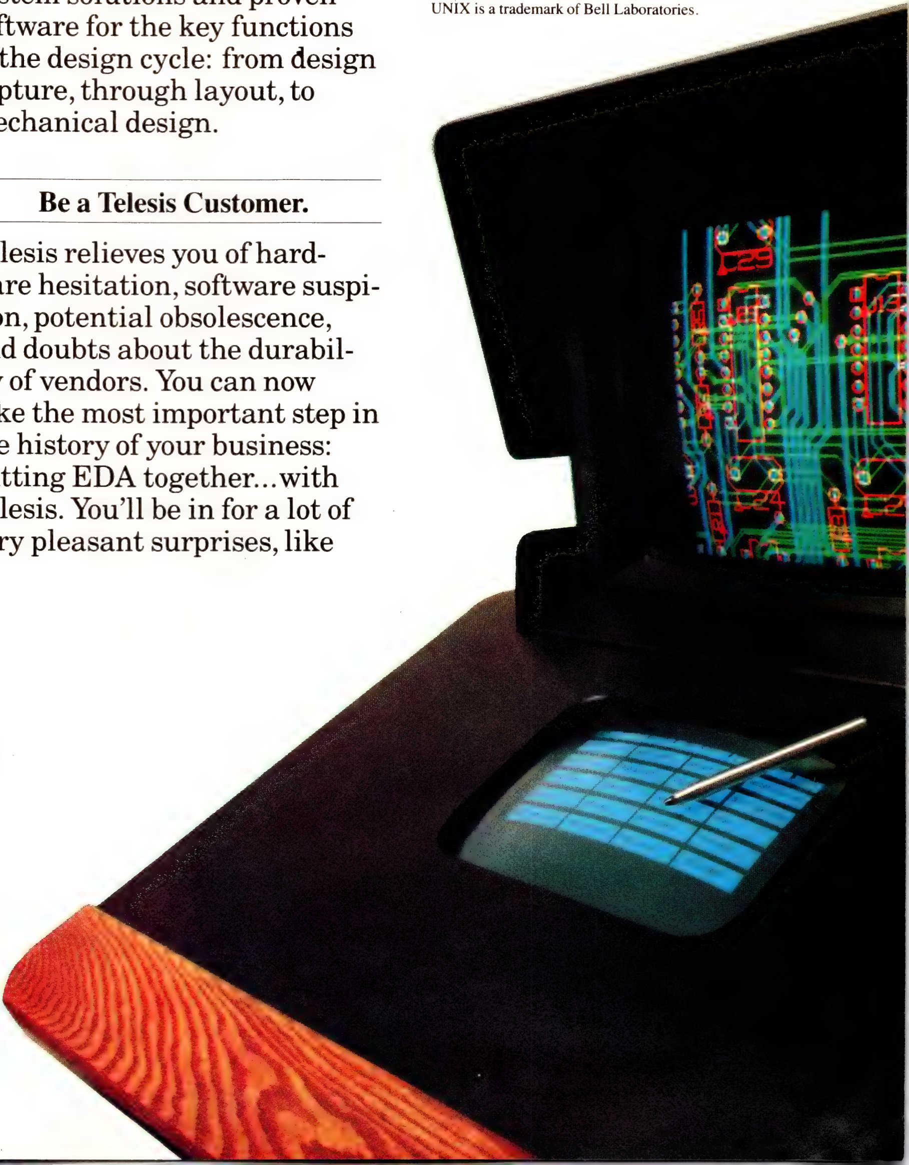
Be a Telesis Customer.

Telesis relieves you of hardware hesitation, software suspicion, potential obsolescence, and doubts about the durability of vendors. You can now take the most important step in the history of your business: putting EDA together...with Telesis. You'll be in for a lot of very pleasant surprises, like personal workstations, 32-bit power, ETHERNET® communications, and the UNIX™ environment. We don't just dream about EDA, we put it together.

And we support and service it through nineteen offices in the United States, Europe, and Japan.

For a sneak preview of the newest link in Telesis EDA systems (we'll give you a hint: it runs on a very popular personal computer), contact Laurie Jackson at (617) 256-2300. She'll be happy to arrange a private showing at Telesis Systems Corporation, 21 Alpha Road, Chelmsford, MA 01824.

ETHERNET is a registered trademark of XEROX Corporation, UNIX is a trademark of Bell Laboratories.



Telesis

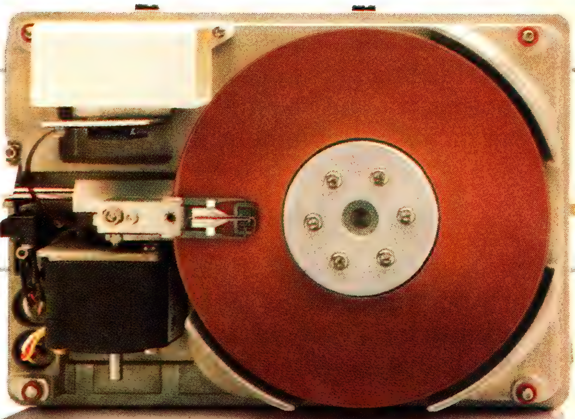
Delivering Engineering Design Automation

Visit our booth at CADCON/Central.

Circle 9 on reader service card

There Are Only Two Thin
New Tested Pairs

The Testing.



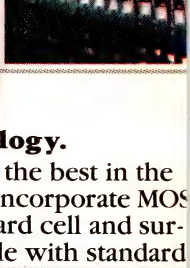
OEMs face major problems trying to decide which hard disk drives to build into their microcomputer systems. What with the wide range of drives, and so many hidden costs associated with evaluation, testing and integration, the process becomes a time-consuming and costly hassle.

But there's a way out—from the company that's helped solve OEM disk controller integration problems more often and over a longer period of time than anybody in the business. That company is Xebec.

From standard-setting to vertical integration, from heavy investment in computer-aided design to the total commitment to the most automated manufacturing technologies, Xebec has demonstrated its leadership position in supplying microcomputer storage solutions.

Tested Pairs. The Guaranteed Match.

With its new tested pairs program, Xebec solves a major industry problem: post-delivery drive failure when interfaced to the controller. Having to do "after the fact" drive testing for many of our OEM customers, we have decided to offer a "before the fact" program. We'll guarantee quality and reliability by assuring a match between our zero defect controllers and a choice of drives in different capacities and form factors.



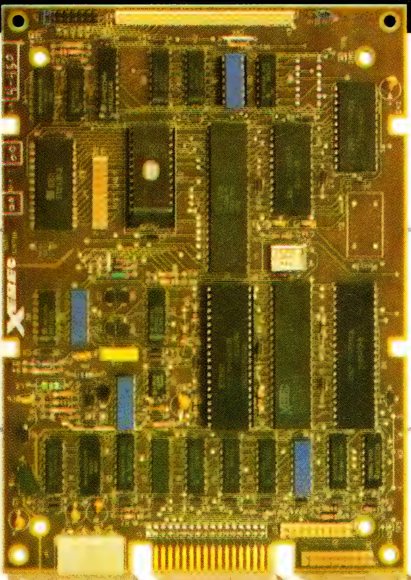
It's simple. Tell us which drives you're considering and we'll test them on Xebec-designed equipment against the most rigorous standards in the industry. Standards we at Xebec have set. Then we'll tell you which of our controllers is the best match for that drive—or we'll customize a controller for you—and accelerate your time to market.

The Edge In Controller Technology.

Xebec controllers are well known as the best in the industry. Their single-board designs incorporate MOS microprocessors and the latest standard cell and surface mount IC technology. Compatible with standard interfaces, our controllers have set the pace with sophisticated data separation, advanced error detection and correction, hard-fault isolation, a high-level

CORPORATE HEADQUARTER
2055 Gateway Place, Suite 600
San Jose, California 95110 U.S.
(408) 287-2700

s That Distinguish Xebec's
torage Solutions.



And The Pairing.

ommand set and other performance and reliability eatures.

Now these superior controllers can be paired with nigh-quality, Xebec-qualified drives. And you save ime and money on evaluation engineering, incoming nspection, and service—while gaining a single-source, ingle purchase order solution to disk drive integration.

The Front Line Of Drive Testing.

We were recently asked to design and ouild a disk drive tester for one of the vorld's largest OEMs. We'll be using that ester to analyze disk drive performance or you. Full environmental testing, ncluding shock and vibration. Full unctional testing at elevated tempera- ures, with read/write tests at marginalized voltages. Careful calculation of hard and oft bit error rates. Complete checking of FCC and other agency emission stan- lards. We'll make sure any drive meets its tated specifications and performance nd quality claims.

How Xebec Does It. And Why.

Xebec can offer its tested pairs service to OEMs because of our commitment to quality. Zero defect quality symbolized by our "Xero D" signature and demonstrated by our superior computer-aided design, manufacturing and testing. Our talented people. Our experience. That's *how* we can provide high-quality products for prices no more than products that deliver a lot less.

Why offer our tested pairs? Why originate a new concept in quality? Enlightened self-interest. Because if we don't, someone else will. Frankly, we want to continue to enjoy the benefits of our leadership position as much as our customers do.

Call Xebec today. Pair up with one of our representatives to find out more about how Xebec tested pairs can benefit you.

Xero D.

XEBEC
The Quality Investment

ALES, INTERNATIONAL,
elgium
2-02-762-9494
ngland
4-734-693511
aly
9-6-350201

SALES, U.S.A.
Sunnyvale, CA (408) 733-4200
Irvine, CA (714) 851-1437
Atlanta, GA (404) 457-9872
Boston, MA (617) 740-1707
Dallas, TX (214) 361-0687
Baltimore, MD (301) 992-7377
Federal (301) 621-3010
Chicago, IL (312) 931-1420

U.S.A. AND CANADA DISTRIBUTORS
Kierulff
Hamilton-Avnet
Avnet Electronics
Hamilton Electro Sales

Circle 11 on reader service card

Squeeze the excess out of circuit board design.

Avoid unnecessary layers in printed circuit boards. Shorten conductor runs. Improve design accuracy.

Let the IBM Circuit Board Design System 2 help. CBDS is highly interactive software that helps you optimize your board designs by automatically handling all the details of a layout as design advances. Even after a designer has worked on a board for hours, CBDS can generally suggest ways to simplify it.

CBDS handles every aspect of board design. You start with a schematic or netlist, and the system helps you create a physical layout. It incorporates a simulator that verifies the logic design, including propagation delay and gate loading, and generates digital test patterns to drive a production-line tester. It creates tapes for photo plotters and numerically controlled production machines. At every step of the process, CBDS automatically insures that you've conformed to your design rules.

Fewer Layers

You can get a board with fewer layers and drillholes—which means less costly, more producible boards and better yields.

Design output is generated automatically from design data. And system resources can be shared by multiple users, who don't have to be computer experts. CBDS is designed for simplified operation by non-DP professionals.

CBDS, with its complete design-to-manufacturing capability, is competitive in price whether you have a few workstations or many. It works with a range of IBM systems from the 4300 series to the 308X family of processors. And with the IBM 5080 Graphics System workstation, you can work in vivid color.

Make sure your printed circuit boards are the best they can be. For more information about the IBM Circuit Board Design System, call IBM toll free at 1 800 IBM-2468, Ext. 111. Or return the coupon.

IBM®

CBDS 9/24

IBM
DRM, Dept. BX/111
400 Parson's Pond Drive
Franklin Lakes, NJ 07417

I want to squeeze the excess out of circuit boards.
☐ Please send me more information on the IBM Circuit Board Design System 2.
☐ Please have an IBM representative contact me.

Name____________________

Title____________________

Company____________________

Address____________________

Phone____________________

City__________State_____Zip_____

Circle 13 on reader service card

NEC NEWSCOPE

NEC AND HONEYWELL BIND LONG-TERM COMPUTER TIES.

NEC and Honeywell Inc., have established a new 10-year business relationship in the computer field.

Under the new agreement Honeywell will market NEC's top-end mainframe, the NEC SYSTEM 1000, with GCOS-8 operating system, in the U.S. as the upper machine of its very large scale DPS-88.

The NEC SYSTEM 1000 is an ultra-large general purpose computer designed for large-scale processing in on-line data base systems, engineering calculations and communications networks.

It has a 64MB main memory and 128 KB cache memory. The NEC SYSTEM 1000 incorporates high-speed logic LSIs, high-density MO LSI memories and LSI high-density packages with up to 60 chips mounted directly on a multilayere substrate.

A very large data array addres function gives direct access to a maximum of 1 gigabyte of data usin a virtual memory. The execution processing unit incorporates an integrated array processor which can efficiently work out large-scale vector and matrix calculations.

NUMBER 131

ALL-SOLID-STATE 10kW VHF TV TRANSMITTER.

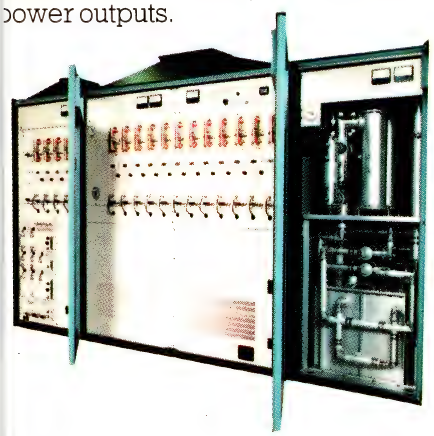
Today's most powerful all-solid-state VHF TV transmitter is available from NEC.

The 10kW transmitter incorporates diverse new technologies. Advances nclude high-efficiency high-power ransistor amplifiers, low-loss RF combiners, high-efficiency switching regulators and a high-performance exiter. It has 12 transistor power amplifier units working in parallel in he video section and 4 such units in he audio section. These feature greatly reduced component counts. A rubidium oscillator is used in con-unction with a synthesizer to assure extra stable carrier frequencies.

Compared to tube types, the new all-solid-state transmitter offers many advantages including extra-high reliability, easy maintenance, unattended operation and complete safety.

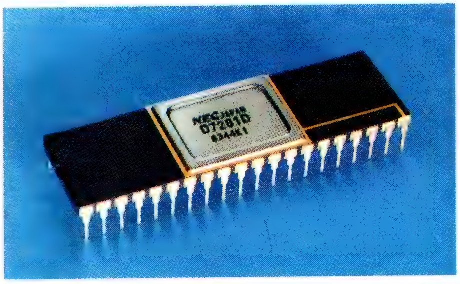
The first unit was delivered a year ago and it continues to demonstrate satisfactory performance.

NEC also offers all-solid-state TV ransmitters with 1kW, 3kW and 5kW power outputs.



NON-VON NEUMANN IMAGE PIPELINED MICROPROCESSOR

Image processing demands repetitive high-speed operations on enormous amounts of data. To perform this task with maximum efficiency, NEC has developed the μPD7281D, the world's first non-Von Neumann type microprocessor with an amazing speed of 5 MIPS*. For processing an image of 640 × 400 pixels, it can rotate pictures or graphics freely to any angle at a speed of 1.4 seconds*.



By drastically reducing cost and size of image processing hardware, the new VLSI can add attractive features to CAD systems, facsimiles, copiers and other office automation equipment.

The μPD7281D is also well suited for high-speed signal processing and numerical calculations—for products such as digital filters, robots and NC systems.

The new VLSI features ☐Data-flow and flexible 5-block circular pipeline architecture. Different computations are independently 'data-driven' within the 5 blocks. ☐Separate input and output buses. ☐On-chip 16 × 16 bit multiplier. ☐200 ns* pipeline cycle for all operations. ☐32 PU instructions including barrel shift, bit operation and bit check. ☐Easy formation of multi-processor system for faster execution. ☐Support LSI soon to be available to interface the μPD7281D with host processor and memory. ☐Easy software development with flow graph, functional assembler and simulator.

*Target figures.

WORLD'S LARGEST LOCAL DIGITAL EXCHANGES IN SYRIA.

The world's largest-scale local digital exchanges are now in service in the Syrian Arab Republic.

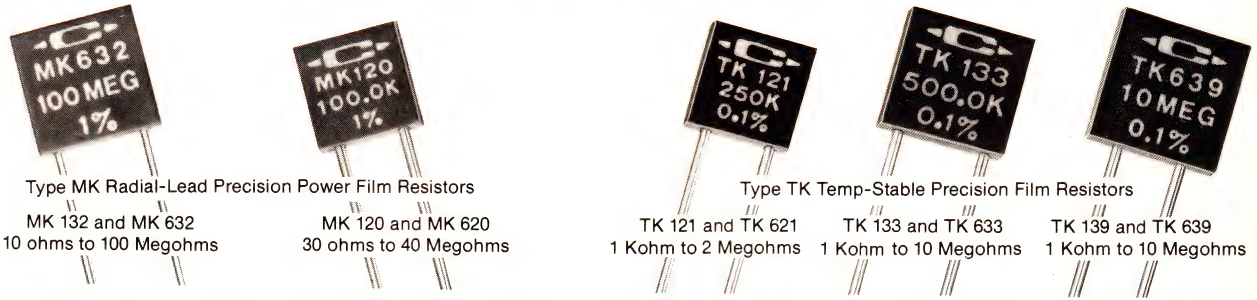
The two NEAX61 multiprocessor digital switching systems in Damascus, the capital, and Aleppo accommodate 40,000 subscriber lines each. At the same time, another 20,000-subscriber line NEAX61 system was also put into service in Damascus, a model city selected by CCITT for telecommunications network digitalization.

Another feat achieved by NEC in the project was to carry out changeover from the existing systems (about 20,000 subscriber lines) overnight.

In addition to the switching systems, NEC has also delivered a total of 145 information service consoles and assistance service consoles.

NEC
NEC Corporation
Tokyo, Japan

Radial-Lead Precision Film Resistors from Caddock combine high values and tight tolerances with a choice of two high-power densities or three low TCs.



Type MK Radial-Lead Precision Power Film Resistors

MK 132 and MK 632
10 ohms to 100 Megohms

MK 120 and MK 620
30 ohms to 40 Megohms

Type TK Temp-Stable Precision Film Resistors

TK 121 and TK 621
1 Kohm to 2 Megohms

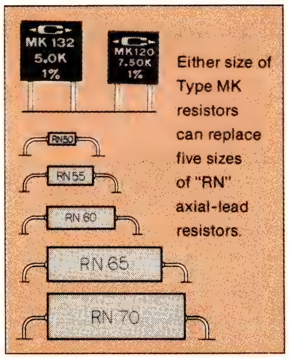
TK 133 and TK 633
1 Kohm to 10 Megohms

TK 139 and TK 639
1 Kohm to 10 Megohms

Type MK Radial-Lead Precision Power Film Resistors utilize Caddock's Micronox® resistance films to achieve high power density and an extended range of resistance values:

Available in two rectangular radial-lead packages that include values as high as 100 Megohms, these high-density film resistors permit electronic circuit designers to optimize packaging and PC board layouts with resistors that meet all these specifications:

	MK 120	MK 620	MK 132	MK 632
• Resistance Range	30 ohms to 2 Megohms	2.1 Megohms to 40 Megohms	10 ohms to 5 Megohms	5.1 Megohms to 100 Megohms
• Resistance Tolerance	±1.0% is standard, to ±0.1% on special order, depending on value and model.			
• Wattage	0.5 Watt	——	0.75 Watt	——
• Voltage	200 V	200 V	400 V	400 V
• Temperature Coefficient	50 PPM/°C Temp Range: −15°C to +105°C, ref. +25°C.	80 PPM/°C	50 PPM/°C	80 PPM/°C
• Package Size	.250" square, .100" thick		.300" square, .100" thick	



Either size of Type MK resistors can replace five sizes of "RN" axial-lead resistors.

These full-size photos comparing the Type MK resistors to "RN" style axial-lead resistors show that the largest Type MK, which is rated at 3/4 watt, requires less board space than the 1/20 watt "RN 50".

And within their voltage ratings, both sizes of Type MK resistors can replace five sizes of "RN" resistors, including the 1/2 watt "RN 70" which requires 10 times the board space of the MK 132 !

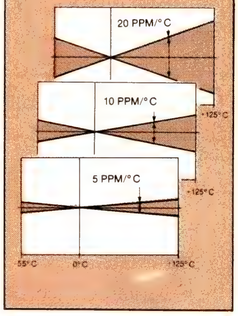
This combination of higher power rating and smaller size can also lower procurement costs by replacing many sizes of axial-lead resistors with Type MK resistors that have a 'standard' size and mounting dimensions.

Type TK Temp-Stable Precision Film Resistors with Caddock's Tetrinox® resistance films combine a choice of TCs of 5, 10 or 20 PPM/°C, a wide resistance range and tight tolerances.

Type TK Temp-Stable Precision Film Resistors provide a combination of performance advantages that are unique in a miniature resistive component:

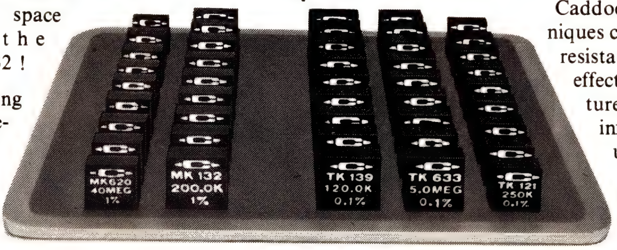
- **Three Standard Temperature Coefficients:** 5 PPM/°C, 10 PPM/°C or 20 PPM/°C over the temperature range from −55°C to +125°C. (+105°C max. for values above 500 Kohms or 1.5 Megohms, depending upon model.)
- **Resistance Range:** 1 Kohm to 10 Megohms.
- **Precision Tolerances:** ±1.0% is standard, and tolerances as close as ±0.05% are available on special order.
- **Load Life Stability:** 0.05% maximum ΔR after 2000 hours at full power at +125°C. (0.2% max. for values above 500 Kohms or 1.5 Megohms, depending upon model.)
- **Two Power Ratings:** .2 watt and .3 watt.

Each model of Type TK resistors has three TC options:



The Model TK 121, TK 133 and TK 139 precision film resistors have demonstrated performance which meets the requirements of Mil-R-55182/9 for thermal shock, moisture resistance, shock and vibration, dielectric withstanding voltage and low temperature operation.

Caddock's high-thru-put manufacturing techniques combined with our advanced Tetrinox® resistance film technology provide this cost-effective way to match the needs of temperature stable circuitry. For price and delivery information on both production and evaluation quantities, contact Caddock's main offices in Riverside, California.



Discover how easily these problem-solving resistors can improve the performance and reliability of your equipment, too. For your copy of the latest edition of the Caddock 24 page General Catalog, and specific technical data on any of the more than 150 models of the 13 standard types of Caddock High Performance Film Resistors and Precision Resistor Networks, just call or write to –

Caddock Electronics, Inc., 1717 Chicago Avenue, Riverside, California 92507 • Phone (714) 788-1700 • TWX: 910-332-6108

CADDOCK
HIGH PERFORMANCE FILM RESISTORS

DESIGN NORM TAKES SHAPE FOR STANDARD CELLS

Systems houses and semiconductor suppliers around the world are enthusiastic over reception of Electronic Design Interchange Format ☐ *by George Leopold*

New York

Semiconductor houses have gone to market with a substantial batch of standard-cell libraries in the past year or so, and producers of engineering work stations have been equally prolific—if not more so. This hyperactivity has led to considerable confusion in the semicustom-circuit market, particularly for systems houses that want such chips.

The confusion should soon give way to order. Since last February, a committee whose members represent the key facets of integrated circuit design, production, and application has been working on an Electronic Design Interchange Format (EDIF) intended as a standard interface language for computer-aided design and engineering work stations.

Last week, EDIF had a lift that practically makes its success certain. Texas Instruments Inc., Dallas, one of the scheme's original proponents, announced that that it had signed an international second-source agreement for standard cells with Philips, the Netherlands, and one of Philips's U.S. affiliates, Signetics Corp., Sunnyvale, Calif. With Philips backing EDIF, the proposed standard should take hold in Europe.

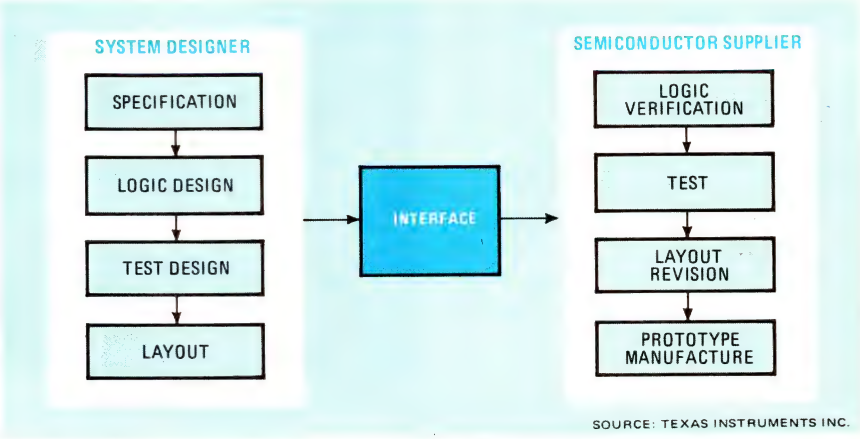
Orderly marketplace. In announcing the second-source agreement, representatives of Philips, Signetics, and TI stressed their desire to bring order to the marketplace through implementation of a standard interface. "We will support all the popular work stations with a standard interface," John Osborne, a Signetics vice president, emphasizes.

Out of the TI-Philips second-source agreement will initially come an extensive standard-cell library of 3-μm complementary-MOS circuits: some 150 standard logic functions from TI and 40 complex medium-scale integration cells from Philips/Signetics. By the first quarter of 1985, the partners hope to start introducing jointly developed 2.3-μm CMOS cells, which will include memory and application-specific functions. Beyond cooperation on ICs, the pact calls for linking design centers around the world—14 of TI's and 13 of Philips/Signetics'.

TI's other international second-source agreements (an important one with Fujitsu Ltd., Japan, covers gate arrays) appear to be giving the firm the leverage to make EDIF, based in part on its Tidal interface language developed in 1983, a standard throughout the world as well as in the U.S. "We have embraced EDIF and we will support it," says Tom Keve, Philips's director of semicustom products. "I think Europe is following."

That belief was backed up at a European briefing held in Brussels the same day TI and Philips announced their deal. Gordon Adshead, manager of design automation strategy at the Manchester, UK, operation of ICL plc, for example, sees no reason why Europeans shouldn't rally behind the program. "There is no equivalent European effort, and as far as I know, no European resistance to the EDIF initiative."

Along with TI, members of the EDIF committee include Daisy Systems, Mentor Graphics, Motorola, National Semiconductor, Tektronix, and the University of California at Berkeley. More than 40 companies have participated during recent tech-



SOURCE: TEXAS INSTRUMENTS INC.

Handling all comers. The Electronic Design Interface Format goal is to enable semiconductor suppliers to fabricate semicustom chips designed at different types of work stations.

nical reviews, including such Japanese firms as Fujitsu and Toshiba Corp.

The group is scheduled to release Version 1.0 of EDIF on Nov. 1, but its steering committee acknowledges that additional work on the proposed interface standard remains. Although Version 1.0 is intended for production implementation, "there will be further versions coming out in the next year," explains Paul Stanford, TI section manager for design automation and a member of the EDIF steering committee. Components of the language such as parametric descriptions, simulation models, design verification rules, and procedural and high-level testing descriptions will still be missing, Stanford says.

Stanford notes that Version 1.0 of the standard will provide full hierarchical descriptions of semicustom chips along with standard-cell library management, administration for the exchange of libraries, and bookkeeping controls (see figure).

Major savings. Malcolm White, product marketing manager for work station vendor Calma Co., of Santa Clara, Calif., notes that "one of the more significant things about EDIF is that you don't have to generate as many custom formatters." White believes this will provide semicustom-design customers with major savings.

Another source of potential savings from EDIF or any other standard interface may be the elimination of the need for costly and tedious software conversions. These conversions might require as many as six man-weeks, according to the chairman of the EDIF steering committee, National Semiconductor's Dick Smith.

Wayne Spence, vice president of TI's Customized Components Division, measures it another way. "At one company, it may cost a half million dollars just to integrate one [type of] work station into an IC-design system. Now, you must keep in mind that the major companies like to have three or four different kinds of work stations, which means you are looking at big dollars just to integrate work stations."

Much of the reporting for this article came from J. Robert Lineback, Dallas Bureau Chief; Robert Gallagher reported from Brussels.

FOREIGN TRADE

Japan looms as a key market for U.S.-made supercomputers

Dallas—Despite a concerted national effort to take the lead in advanced computer technology, Japan in 1984 is becoming the land of rising sales for U.S. supercomputer makers. It is, in fact, considered by some U.S. vendors to be a key opening in the market window.

The potential increase in business is due in part to an emerging demand spurred by Japan's efforts in many high-technology industries, including supercomputers. Commercial interest in purchasing supercomputers has also been heightened by the initial marketing efforts of the nation's own computer houses.

Prior to this year, only two U.S.-made supercomputers had been planted on Japanese soil, says senior market analyst Norman Weizer of Arthur D. Little Inc., Cambridge, Mass. Both were sold to universities in 1980, and both were first-generation systems from Cray Research Inc. of Minneapolis.

Since then, sales in Japan have significantly lagged U.S. and European markets, notes Weizer. But many corporate researchers in Japan are now reaching the point where they need supercomputing power to advance solid-state electronics, chemical processing, vision-capable robots, and other intelligent digital systems. Thus, the seemingly sudden interest in acquiring the big machines.

Cray sales. Cray is an early beneficiary of the Japanese hunger for supercomputers. After an initial tangle with the Commerce Department in a review for a U.S. exporting license, Cray last month installed its first leading-edge X-MP supercomputer in Japan. While the $12 million system was awaiting shipment to Nippon Telegraph & Telephone Public Corp., Cray announced the sale of a second X-MP to an undisclosed Japanese commercial customer. Delivery will be completed in early 1985, says Marcelo Gumucio, Cray executive vice president.

In Aurora, Colo., Denelcor Inc. is undergoing review for a technology export license required to ship the firm's first parallel-processing HEP system to Japan. To entrench itself better in the embryonic supercomputer market there, Denelcor has

Outward bound. A growing demand by Japan's high-technology industries is opening up a potential commercial market for U.S. supercomputers such as this one from Cray.

teamed with Shoko Co. Ltd., Tokyo, a multibillion-dollar trading house that landed the $2 million HEP sale to Showa Denko K.K., Tokyo. The buyer, a large chemical firm, plans to use the highly parallel-processing, multiple-instruction and -data (MIMD) computer for molecular modeling in its research laboratories.

"We think it's a pretty important sale," says R. David Lowry, manager of market development, referring to the fact that despite the continuing work of three Japanese companies—Fujitsu, Hitachi, and NEC—in supercomputers, a Denelcor machine was selected. This, says Lowry, is because it is a substantively different machine from those with which the Japanese customers are working.

"We believe they have recognized that purely vector machines are not the subtle solutions," Lowry adds. "Eventually, you'll have to have MIMD machines, specialized vector machines, and perhaps image processors. So we believe we'll enjoy a good market over there." Conventional supercomputers are based on von Neumann architectures with single-instruction, single-data streams.

Denelcor believes its MIMD advantage is strengthened by Japan's much-publicized fifth-generation computer project, which is heavily oriented toward parallel-processing architectures. The firm also believes it will enhance its product's attractiveness in Japan after converting AT&T Bell Laboratories' Unix operating system to run in a real-time parallel-processing environment. To do this, Denelcor software engineers "completely threw out the Unix kernel and rewrote 10,000 lines of code," Lowry says. The result is called HEP/UPX and replaces Denelcor's original proprietary HEP/OS operating system.

More entries. Other U.S. supercomputer houses, such as Control Data Corp., Minneapolis, and CDC spinoff ETA Systems Inc., St. Paul, Minn., are also evaluating Japan's commercial market. Traditionally, supercomputer buyers in Japan have been government agencies and universities, which have favored indigenous manufacturers. However, Lloyd M. Thorndyke, president of ETA, believes that Japan will develop into a major commercial market for his firm's supercomputers once they hit the market in a couple of years.

"It's just a little more difficult to sell there because you are not in a [commercial] market that has been identified. But with the Japanese in the market, you can now start riding the development," he says, adding that lower cost of capital and long-term outlook on investments will help breed a large market in Japan.

Cray's Gumucio believes the increase in Japanese purchasing activity is merely part of a worldwide trend. He says recent U.S. sales illustrate that Japanese firms do not have a lock on the Far Eastern supercomputer business, which remains a "competitive arena with many variables, including hardware, software, service, and distribution."

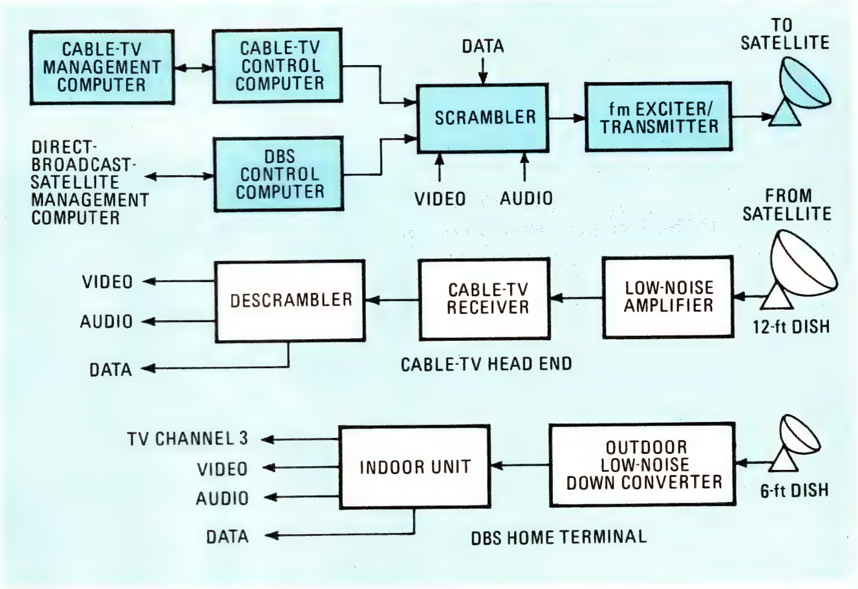
Despite the sales increase, Japan's supercomputer purchases remain small compared with European and U.S. markets, notes Weizer. In a private study completed earlier this year, the research firm reported that 26 supercomputers were shipped worldwide in 1983, representing about $250 million. U.S. supercomputer houses delivered 15 systems in the U.S. and nine in Europe, says Weizer. Two Japanese-made supercomputers were installed in Japanese universities last year, he reports.

Revenues up. Weizer says revenues—which can swing widely on the completion or delay of a few installations—are rising 20% to 40% annually. "There is a great potential in Japan, but also a major barrier: the national pride of wanting a world-class supercomputer industry," he says. "Clearly, over the past couple of years, the Japanese firms have understood that they have to use a home market as a springboard to the rest of the world or they will not be successful." **–J. Robert Lineback**

COMMUNICATIONS

HBO is buying M/A-Com system to scramble its cable signals

San Diego—Determined to stop an estimated 800,000 to 1 million owners of home satellite dishes from stealing signals destined for fee-paying cable TV watchers, Home Box Office Inc. has invested $10 million in a new video scrambling-and-unscrambling system. The New York company will install the system early next year and allow its 5,500 cable



Lock-and-key. Home Box Office hopes a new scrambling system from M/A-Com Linkabit Inc. will help it to stop up to 1 million homeowners with satellite dishes from stealing signals.

affiliates to use it free of charge.

For the designer, M/A-Com Linkabit Inc., here, the deal positions it to set the *de facto* scrambling standard for the cable industry. "As the first programmer to scramble its shows, HBO is blazing the trail for other pay services," says William Riker, director of engineering for the National Cable TV Association.

If HBO succeeds, other pay service operators will have to adopt the M/A-Com technique to save the cost of providing their cable head ends with different equipment, he believes. Currently, there are 6,000 cable operators nationwide, which translates into a demand for 12,000 decoding units (one operational and one spare), he adds.

Secret key. The M/A-Com system, known as Videocipher II, is based on the National Bureau of Standards' Data Encryption Standard. On the transmission side, every program is scrambled and uplinked with a DES encrypted key, which has 72 quadrillion possible solutions.

"Because the secret keys are stored in custom chips that effectively create a ROM, it is virtually impossible to read the key off chips by looking at the signals on the pins," claims Mark Medress, assistant vice president of Linkabit's video group. But even if the secret key were discovered and copied, all the programmer need do to defeat the unauthorized intruder is change the key in which a particular show is sent.

Only audio data is encrypted with the DES algorithm, Medress points out. Video scrambling was implemented digitally in Videocipher I through line-segment displacement, in which each line is digitized, divided into random pieces and then shuffled around. But the cost of doing that proved to be too expensive. Videocipher I rolled out last January at a cost of $5,000 per system.

To drive that cost down to $500 per system—an HBO requirement—Videocipher II was built to achieve security nondigitally by eliminating the synchronization information and signal inversion. It replaces the signal's sync information with digital data from the two audio channels and inverts the video information (that is, changes black to white, red to blue, and so forth). The custom circuitry in the descrambler regenerates the normal sync information required by the TV receiver.

Contained in an M/A-Com receiver or operating as a stand-alone descrambler, Videocipher II works in direct-broadcast-satellite applications as well as with cable. With millions of consumers expected to buy DBS antenna receiving units, the most lucrative market for scrambling devices lies with this service, notes Medress.

Direct broadcast. Just as M/A-Com could become the *de facto* standard setter for cable TV., so could Scientific Atlanta Inc., in Atlanta, set the standard for DBS. The firm says it is close to a deal to supply Satellite Television Corp., New York, the first DBS programmer scheduled to go on the air, with both transmission and scrambling-encryption designs. By being first, Scientific Atlanta could lock up the market for DBS receiver-unscramblers; its transmission system is B-MAC, a version of the time-multiplexed analog component format used in the UK.

"Basically, picture synchronization is destroyed by speeding up some lines by several microseconds and slowing down others by the same amount," explains Charles Rhodes, Scientific Atlanta's principal engineer. At the receiving end, each line is stored and clocked out either faster or slower to produce the original image. Overall, the baseband processor of the receiver functions as an unscrambler and decrypter.

"M/A-Com's video scrambling is very primitive. . . . Sooner or later the picture has to appear in the clear just by accident. Moreover, we think the DES algorithm is susceptible to penetration simply because of its popularity," asserts Rhodes.

Because Satellite Television will be the first to get up and running, it has the opportunity to set both the transmission and scrambling-encryption standards for DBS, claims Rhodes. To save time and money "the second starter will be inclined to follow its lead," he argues.

VLSI economies. But M/A-Com says new very large-scale integrated circuits will economize line-segment displacement in Videocipher III, which is scheduled for introduction in 1986. Furthermore, it is compatible with the B-MAC format.

And with at least a year and a half to go before DBS becomes a reality, Medress says he isn't concerned about the Satellite Television-Scientific Atlanta partnership. By then, he speculates, DBS could be eclipsed by the use of C-band and Ku-band satellites to transmit directly to home-earth-station owners. **–Karen Berney**

SOFTWARE

After takeover, Tymshare unit offers variety of packages

Time out. Timesharing is dead, says Tymshare Inc.'s Laszlo R. Rakoczi, who promotes systems allowing mainframes to share data bases with mini- and microcomputers.

Cupertino, Calif.—The first clear sign of Tymeshare Inc.'s new direction after its takeover last spring by McDonnell Douglas Corp. appeared this month in the form of a new Tymshare division with a new product. Tymshare's former Systems Technology Division is now InfoTym; instead of providing remote computer services, it sells office automation products to original-equipment manufacturers and to other

NEW: three-in-one

Synthesizer + Sweeper + Signal generator
= Sweep Generator SWP 100 kHz–2,5 GHz

Three signal generators combined in a single unit – this concept, realized for the first time in the Sweep Generator SWP, offers a low-cost and convenient solution to your RF measurement problems up to 2.5 GHz. The SWP opens up entirely new fields of application.

Synthesizer

- Crystal-referenced frequency; resolution 1 kHz
- Low content of harmonics and spurious signals: typ. 40 and 50 dB down
- Low spurious deviation down to <5 Hz (CCITT weighting)
- Short transient time

Sweeper

- Continuous sweeping over the entire frequency range
- Sweep time 10 ms to 100 s
- Six variable frequency markers and additional 1/10/100-MHz markers
- Level sweep; resolution 0.1 dB

Fields of application

- Narrow-band sweeping, e.g. for measurements on crystal filters
- Automatic network analysis, e.g. using Vector Analyzer ZPV
- Swept-frequency multi-signal measurements without external synchronization
- Compression measurement with level sweep

Additional features

- Simple operation (entry and variation via keyboard, single rotary knob or step key)
- CMOS memory for ten complete instrument settings
- IEC 625 bus (IEEE 488): Listener, talker, SRQ and learn mode

Please ask for the detailed SWP data sheet

Signal generator

- Precise level setting from −110 to +10 dBm, resolution 0.1 dB
- Amplitude modulation
- Frequency modulation
- Pulse modulation

Rohde & Schwarz GmbH & Co. KG
Postfach 80 14 69
D-8000 Muenchen 80
Federal Republic of Germany
Telex 523 703 (rus d)
Tel. internat. + (49 89) 41 29-1

There are **R & S agencies** in 80 countries.
We plan and supply stationary and mobile systems, also on a turn-key basis.
R & S services comprise installation, maintenance, calibration, training and documentation.

ROHDE & SCHWARZ

Measuring Instruments and Systems · Sound and TV Broadcasting
Radiomonitoring and Radiolocation · Radiocommunications

Circle 98 on reader service card

1 SWP E 07/4

McDonnell Douglas subsidiaries.

McDonnell Douglas is melding Tymshare into its Information Systems Group after buying the timesharing company last spring. Thomas J. O'Rourke, Tymshare's founder and president at the time of the sale, is now listed as a senior consultant.

"Timesharing, as originally conceived in which you sell computer cycles one by one to an end user for the end user's benefit, is basically dead," says Laszlo L. Rakoczi, a Tymshare group vice president who pioneered the technology in the 1960s. "There is no longer an economy of scale."

Share data. Rakoczi's group has developed hardware and software that essentially allows mainframes to share their data bases among mini- and microcomputers of different types. The group is now trying to sell the concept to corporate management information system departments.

InfoTym, headed by divisional vice president Ken Jones, is part of Rakoczi's Computer Technology group. It has purchased rights to a package called Reveal, which combines decision support and artificial intelligence, and to an integrated office software package that it markets under the name TymIV. It's promoting its software at technical seminars and through a small direct sales force. "We are a software marketing company providing end-to-end, personal computer to mainframe products to McDonnell Douglas and elsewhere," says Dave Morley, InfoTym marketing director.

Reveal runs on IBM Corp. 370 mainframes, as well as on Digital Equipment Corp. VAX and Prime Computer Corp. minicomputers and IBM Personal Computer XTs. The TymIV package is based on a software interface called the ExecuBus, which is written in C and can be used on a number of systems. The package, originally developed by a Dallas firm called Executec Corp., essentially isolates applications from an operating system. Any applications written for it can be moved to new hardware along with the bus.

InfoTym is adding a marketing and sales staff to the development staff left from its days as Systems Technology. It is also adapting some of the mainframe operating system software marketed by Rakoczi's group. An example is the Virtual Storage Access Method (VSAM) interface for mainframe program development. With InfoTym's version for the XT, programs can be written and tested on that machine and then transmitted for use on the mainframe.

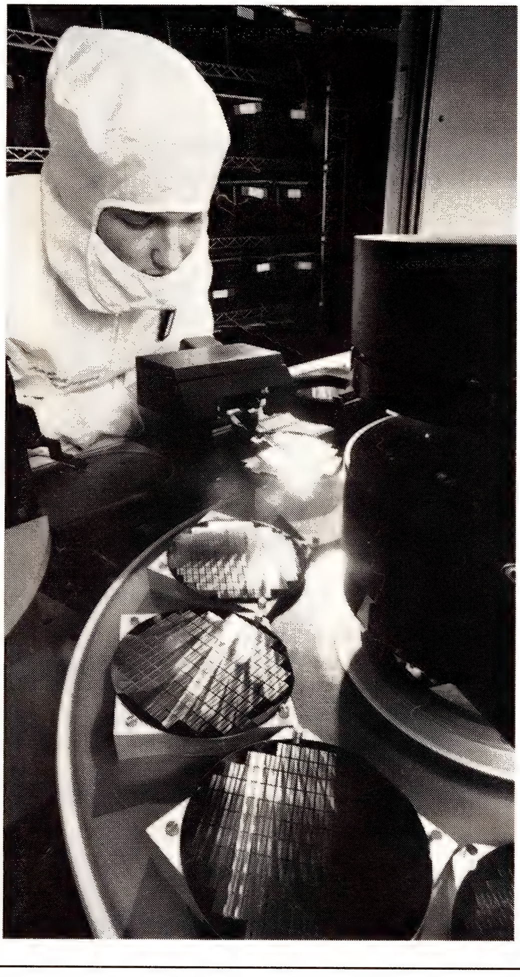
–Clifford Barney

MEMORIES

IBM's 256-K RAM joins other chips

Rye Brook, N.Y.—Add IBM Corp. to the list of those producing 256-K random-access memories in volume. The firm's semiconductor manufacturing and development center, in Essex Junction, Vt., is making the 256-K chip in a big way, although it declines to say how big.

Using the n-MOS chip, IBM says, it can assemble more than 4 million characters of information on a single circuit card of about 7 in. by 9 in.; the firm reports that this is the densest computer memory package it has ever offered.



In the chips. Joining other chip makers, IBM Corp. is in volume production of its 256-K RAM, shown here in wafer form being positioned for ion implantation.

According to IBM, the chip, which has 1.5-μm geometries, is fabricated with conventional optical lithography techniques. All the 256-K RAMs that IBM makes will be used internally.

IBM is in good company in mass producing a 256-K chip. Other makers include AT&T Co., New York, in the U.S., while such Japanese producers as NEC, Hitachi, Fujitsu, Toshiba, Mitsubishi, Oki, and Matsushita all are selling them.

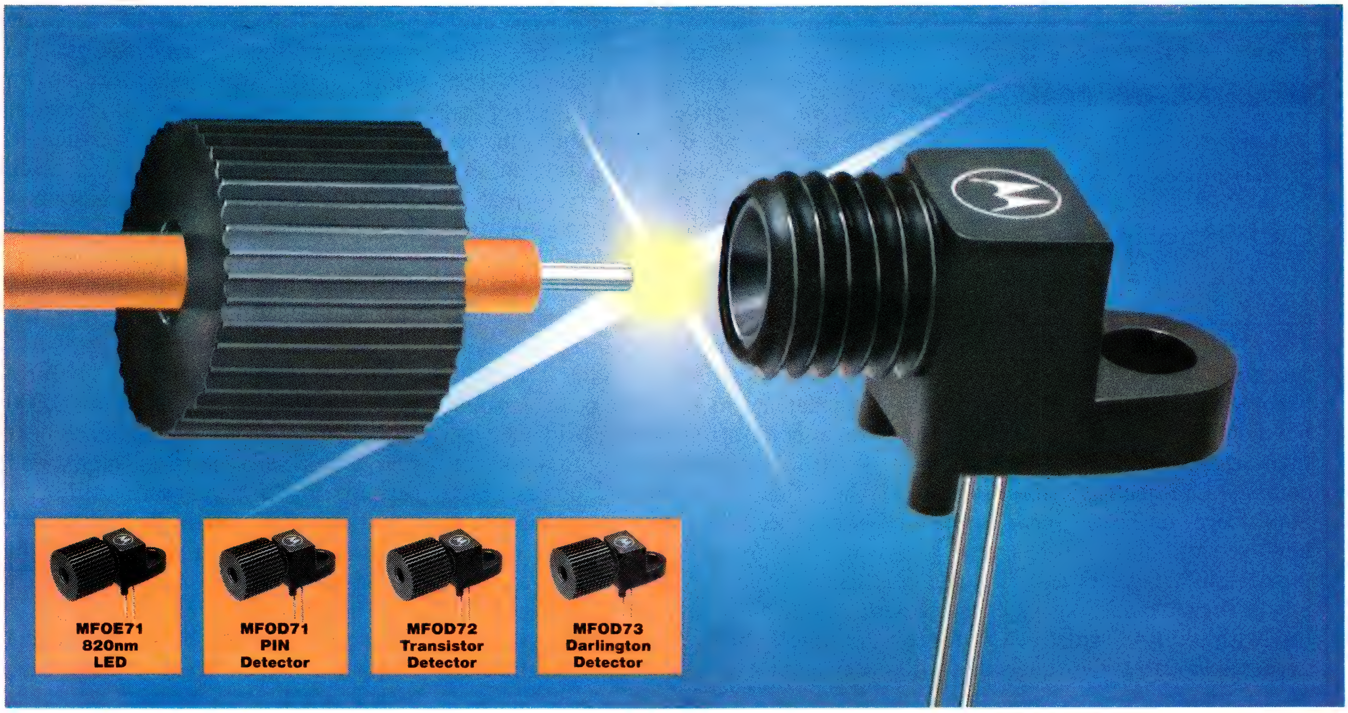
An AT&T representative notes that the firm has been making its 256-K RAM in volume for "more than a year" at its components plant in Allentown, Pa. AT&T is building other chip-fabrication centers in Kansas City, Mo., and Orlando, Fla., and hopes to have them in operation early next year.

Besides using the 256-K RAM in house, AT&T is selling it on the merchant market. The firm declines to say how many customers it had for the chip or how many of the chips it is making.

In Tokyo, NEC Corp. says it began limited shipments of its 256-K RAM in May 1983, but volume shipments—lots of 10,000 units—only started at the end of 1983. NEC now says its total monthly shipments of the chips hit 1 million in July and are expected to double by the end of the year. Hitachi Ltd. is near that run rate, while Fujitsu Ltd. is not far behind. Toshiba Corp. and Mitsubishi Electric Corp. are each shipping about 50,000 of the 256-K chips a month.

As for other U.S. sources, Motorola Inc., Schaumburg, Ill., and Mostek Corp., Carrollton, Texas, are both sending samples to custom-

Low-cost, 10 MHz fiber optics. Popular. Without the mechanics.



Motorola Semiconductor's fiber optic technology presents what is sure to become the most widely-used, most economical family of fiber optic emitters and detectors.

In one, low-cost, easy-to-use, integrated plastic package.

The FLCS family. For Fiber Optic Low-Cost Systems

10 MHz Performance.

The new FLCS GaAlAs infrared emitter, MFOE71, emits 820 nm light to provide DC to 10 MHz bandwidth performance over more than 10 meters of economical, Dupont or Eska, plastic, 1,000 micron fiber—fast enough to handle data transfer between virtually all personal and business computers.

Broad Detector Selection.

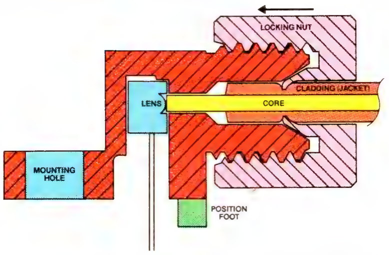
FLCS silicon detectors include a fast PIN diode, standard phototransistor and a high-gain photodarlington.

Linked with the MFOE71, the MFOD71/72/73 devices have spec'd minimum response of 0.15, 80, and 6000 μA/μW respectively, at one meter, allowing tailoring to a wide variety of applications through appropriate detector choice. A fast, digital output Schmitt trigger will be available soon.

No tools. No trouble.

These miniature packages totally integrate active element, connector and mounting for aligning and holding the cable in a quick, easy, go-anywhere, do-anything package. No polishing. No epoxy. No extra parts.

FLCS PACKAGE CUTAWAY



It's simplicity itself to link them up. All you need is a razor blade and wire stripper to cut the cable and strip off ⅛″ insulation. Insert into the FLCS package and lock into position with the knurled knob and you're done.

Cut. Strip. Connect.

Fast, efficient, reliable connection in 60 seconds or less.

There's even a flange for firm board mounting.

EUROPEAN HEADQUARTERS:
Geneva, Switzerland
Sales Offices:
Bologna
Copenhagen
East Kilbride (Scotland)
Genoble
Hannover
Johannesburg
Maarssen
Madrid
Milan
Munich
Nuremberg
Oslo
Paris
Rennes
Rome
Toulouse
Sindelfingen
Stockholm
Vienna
Wembley (Middlesex)
Wiesbaden
Zurich

ASIA/PACIFIC HEADQUARTERS:
Hong Kong
Sales Offices:
Seoul
Singapore
Sydney/Melbourne
Taipei
Tokyo

A FLCS pair for less.

You can't buy a lower-cost emitter-detector pair than these.

Prices are lower in one-up, 100-up, 1,000-up and even higher quantities.

Comparably-performing units are as much as an order of magnitude higher in cost — plus connector and labor.

FLCS are the ideal parts for general-purpose application in non-hostile environments: one-shot PCB interconnect, CPU-to-peripheral, copy and coin machines, autos, appliances, anyplace you want to send electrical signals without sending interference.

Contact Motorola Semiconductor Products, Inc., P.O. Box 20912, Phoenix, AZ 85036 for FLCS data.

For plain-and-simple Fiber Optic Low-Cost Systems.

MOTOROLA
International Semiconductor Group

Write To: EUROPE: Motorola Ltd., European Literature Center, 88 Tanners Drive, Blakelands, Milton Keynes MK14-5BP, United Kingdom.
ASIA/PACIFIC: Motorola Inc., International Semiconductor Group, P.O. Box 80300, Cheung Sha Wan Post Office, Hong Kong.

Please send me more information on the FLCS family.

196EW092484

Name ______________________
Title ______________________
Company ______________________
Address ______________________
____
Call Me. Phone: ______________________

ers. Texas Instruments, Dallas, has not yet officially announced its chip, but executives recently indicated that the firm is ramping up volumes and deliveries. **–Robert J. Kozma**

DISPLAYS

Beam-index tube shines in projector

Tokyo—The beam-index color picture tube, which has a single electron beam and no color selection mask, has finally found itself a niche—as a high-brightness picture source for compact projection TV systems. Sony Corp. of Tokyo has designed a new version of the tube, first proposed some 30 years ago, and put it into a luggable 15.5-kg video projector with built-in video cassette recorder and cable-TV tuner that will go to market in the U.S. in early October with a $2,995 price tag.

The tube has a peak brightness of 1,600 L, some six to eight times that of highest-quality shadow mask tubes. Just as important for this application, a single projection tube eliminates the convergence adjustment required for conventional systems, with their three single-color tubes. Moreover, pictures ranging from 30 to 200 in. diagonally can be projected to suit the size of the picture to the size of the audience.

On the beam. The beam-index tube design includes much of the technology developed earlier by Sony in an experimental 32-in. tube [*Electronics,* July 14, 1981, p.73]. It utilizes beam current and voltage levels that rule out the use of a shadow-mask tube (the heated mask would warp out of shape). What's more, in the new tube about 70% of the beam current strikes the color phosphor stripes. Even so, for the video projector, average beam currents as high as 550 μA accelerated to 31 kV pump up to 17 W into the 5¼-in. faceplate. Thus cooling is needed, done by convection in an ethylene glycol-water mixture in the space between tube faceplate and a glass cover plate, which transfers the heat to a diecast zinc flange, where it is dissipated.

The width of the beam in an index tube must be kept small because there is no mask or other selection mechanism to keep the beam headed for a color stripe of one primary color from spilling over onto those of the other two primary colors. For this tube, Sony engineers designed a new type of high-performance unipotential electron gun with a triode cathode lens for small spot size. It produces an oval beam with a vertical main axis that is only 0.2 mm at the maximum beam current.

This is remarkable performance for an electron gun. But even with the compact beam, there had to be design tradeoffs to keep the tube small and light enough for portable equipment.

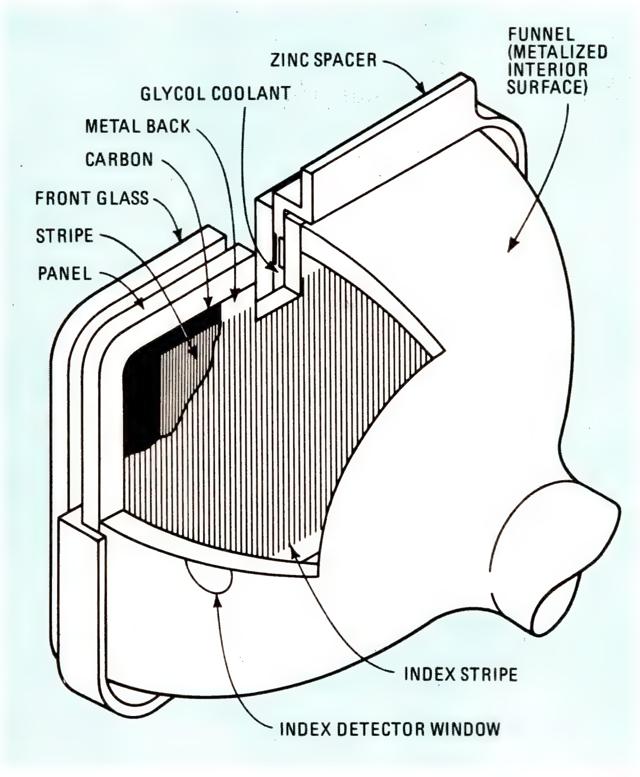
For example, only 256 color-stripe trios can be used. Further, to maintain sweep linearity, the index stripe pitch is only twice that of the primary color phosphor pitch rather than four times as in the experimental 32-in. tube. This gives about the same number of index stripes across the width of the tube. Microprisms on the cover glass, however, spread out the stripes projected by the tube to fill in the shadows left by the black guard bands between color stripes. The projected image's stripe structure is not obvious; to the viewer the resolution appears to be higher than one would imagine considering the number of color stripes.

Modest start. Sony says picture-tube production will start at 3,000 units a month and will increase next year when sales start in Japan and perhaps in other markets. Although quantities are relatively small, the tube supports a reasonably high-priced system that could not otherwise be made.

The only other beam-index tube now in production is a 1-in. tube with a much coarser stripe structure that Hitachi Ltd. is building at a rate of about 1,000 a month for use in a video camera viewfinder.

Sony never went into production on its earlier 32-in. design because production economies would not be sufficient to warrant fabrication of a completely different kind of color picture tube. Nor did Matsushita Electric Industrial Co. build the 5-in. tube for which it developed a prototype some five years ago; that tube was intended for a portable TV receiver powered by dry cells, and officials finally decided there wouldn't be a sufficiently large market.

There is a chance, though, that Sony can develop a market for both TV and data-processing displays to make a beam-index version of its flat tube [*Electronics-Week,* Sept. 17, p. 18] pay. Flat tubes would make for a more compact unit, and by marketing displays for computers and other products Sony could open up a large-enough market to warrant producing a flat beam-index tube. **–Charles L. Cohen**



Off with the mask. Sony's beam-index color tube achieves its exceptional brightness by eschewing the shadow mask—which absorbs 90% of the beam energy in a conventional tube.

Silicided lines speed up EPROM

Sagamihara, Japan—Engineers at NEC Corp.'s 1st LSI Division have developed a 1-Mb erasable programmable read-only memory that uses titanium-silicided word lines to provide a typical access time of only 100 ns. The technique is expected to make an important contribution to the manufacture of the high-speed circuits of this type that will be needed for 16- and 32-bit microprocessors. Conversion of the n-MOS peripheral circuits to complementary-MOS should complete the design of a commercial product, which will probably have the same word-wide 16-bit bus and 40-pin package as the prototype.

It boasts minimum dimensions of 1 μm for the polysilicon gates in the memory cells and 1.2 μm in the peripheral circuits. The fine patterning contributes to the chip's high transistor speed and small size. Memory cell area is a mere 25.5 μm^2, while chip size is only 7.5 by 5.8 mm.

The fine patterning also makes for large delay time in the polysilicon word lines and interconnections in the peripheral circuits that are continuations of the polysilicon gates. Gate poly has a resistivity of 20 to 30 Ω per square. Resistance of the lines thus increases as they become finer, and the high resistance-capacitance time constant slows down the circuit. Titanium silicidation of the lines reduces their resistivity to 2 Ω per square and decreases the delay time in them from 60 ns to 5 ns.

The prototype chip is 20% smaller than an earlier chip that had an access time of 180 ns. The smaller geometry speeded operation of the chips, while the silicidation further slashed delays in the on-chip interconnections. NEC engineers say that the 1-μm gate length in the memory cells makes it possible to program each byte in only 1 ms with a 13-V programming voltage. The somewhat larger 1.2-μm gate length that is used in the prototype's peripheral

OKI Announces a New Era in Plasma Graphics

The OKI SS Series of plasma displays offers a new way of communicating complex ideas for industry and the consumer. The flat displays provide a compact alternative to bulky CRTs in personal computers. Fine resolution and elimination of flicker and glare reduce operator eye-strain and fatigue.

Other applications include point of sale and banking terminals, measuring instruments and numerical control machines.

- **SS640400R** (W 640 dots × H 400 dots: Neon orange) (Under development)
- **SS480240R** (W 480 dots × H 240 dots: Neon orange)
- **SS320160R** (W 320 dots × H 160 dots: Neon orange)
- **SS256128R** (W 256 dots × H 128 dots: Neon orange)
- **SS192020R** (W 192 dots × H 20 dots: Neon orange)
- **SS096016R** (W 96 dots × H 16 dots: Neon orange)

OKI ELECTRONIC DEVICES

Oki is looking for sales representatives in your area.

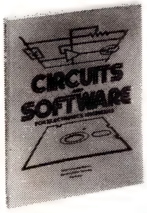
S. YAMAMOTO Overseas Marketing
4-10-3 Shibaura, Minato-ku, Tokyo 108, Japan Tel.: Tokyo (03) 454-2111 Telex: J22627

OKI electric industry company, ltd.

Circle 25 on reader service card

SOLUTIONS TO DESIGN PROBLEMS

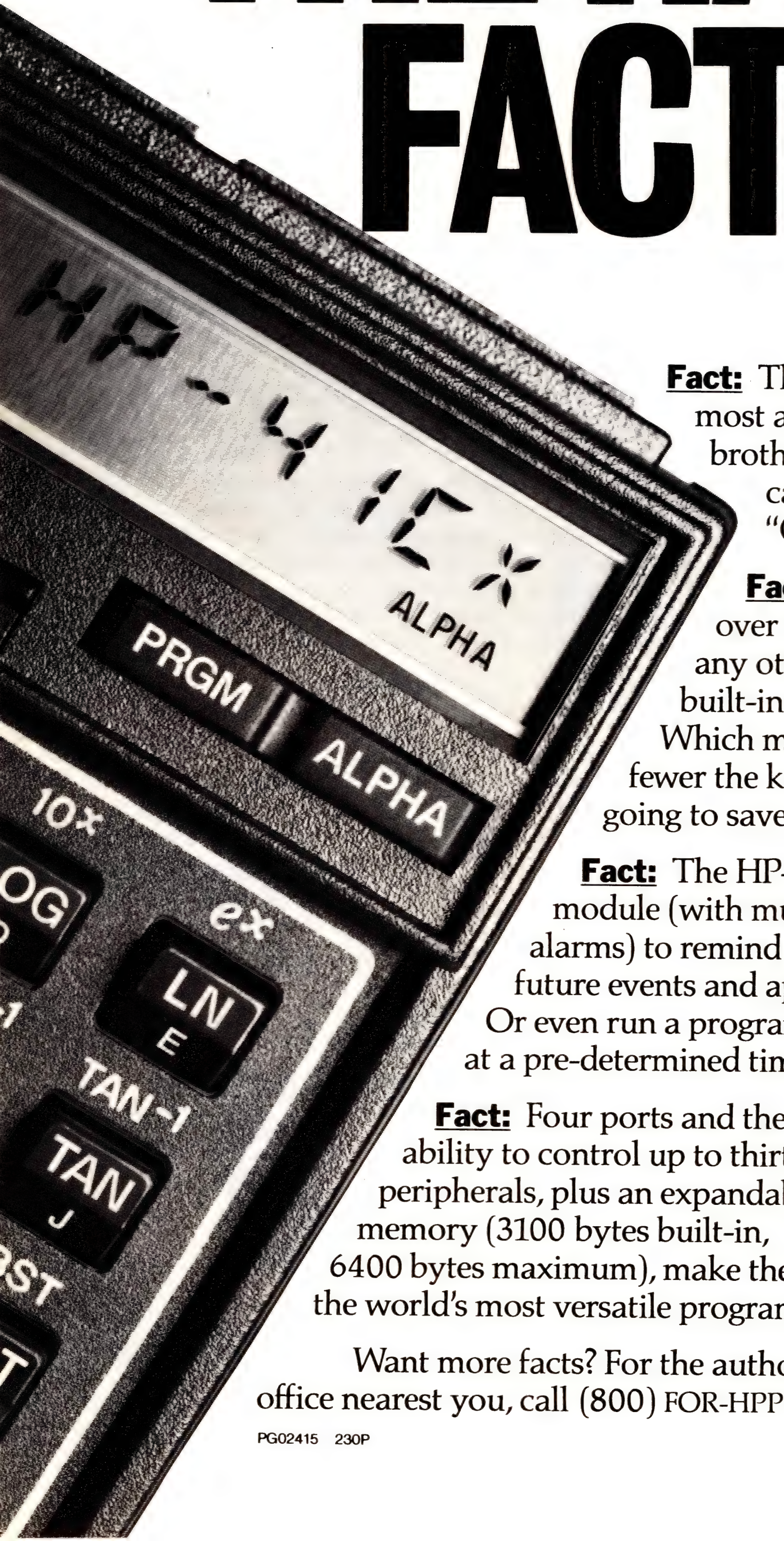
CIRCUITS AND SOFTWARE
FOR
ELECTRONICS ENGINEERS



This invaluable resource is available for only $19.95. Focuses strictly on design problems and delivers professional, innovative solutions for your most demanding projects. STAY ON TOP OF THE LATEST CIRCUITRY DEVELOPMENTS. Order your copy today! Send $19.95 to:

Electronics Magazine Books, 1221 Avenue of the Americas, New York, NY 10020

THE HARD FACTS.



Fact: The HP-41CX is Hewlett-Packard's most advanced calculator—a brother of the HP calculator NASA carries onboard the Space Shuttle "Challenger."

Fact: The HP-41CX now features over 200 functions. More than any other calculator. Including a built-in extended functions module. Which means *fewer* keystrokes. And the fewer the keystrokes, the more time you're going to save.

Fact: The HP-41CX has a built-in time module (with multiple alarms) to remind you of future events and appointments. Or even run a program at a pre-determined time.

Fact: Four ports and the ability to control up to thirty peripherals, plus an expandable memory (3100 bytes built-in, 6400 bytes maximum), make the HP-41CX the world's most versatile programmable calculator.

Want more facts? For the authorized HP dealer or HP sales office nearest you, call (800) FOR-HPPC.

PG02415 230P

THE SOFT FACTS.

Thermal & Transport Science Pac
Petroleum Fluids Pac
Clinical Lab & Nuclear Medicine Pac
Circuit Analysis Pac
Aviation Pac (For Pre-Flight Use)
Financial Decisions Pac
Home Management Pac
Machine Design Pac
Real Estate Pac
Securities Pac
Stress Analysis Pac
Games Pac
Equations of State
Reversible Polytropic Process for an Ideal Gas
Conduit Flow
Fluid Transport Numbers
Single Stage Equilibrium Flash Calculation
Weak Acid/Base Titration Curve
Steel Column Formula
Reinforced Concrete Beams
Stress in Thick-Walled Cylinders
Properties of Special Sections
Compressive Buckling
Spring Constant
Free Vibrations
Interference Fits
Linear or Angular Deformation
Constant Acceleration
One Sample Test Statistics for the Mean
Test Statistics for the Correlation Coefficient
Differences Among Proportions
Behrens-Fisher Statistic
Kruskal-Wallis Statistic
Mean-Square Successive Difference
The Run Test for Randomness
Interclass Correlation Coefficient
Fisher's Exact Test for a 2x2 Contingency Table
Bartlett's Chi-Square Statistic
Mann-Whitney Statistic
Kendall's Coefficient of Concordance
Number Hunt
Baseball Simulation
Magic Squares
Script Letters
Matrix Operations
Black Body Thermal Radiation
Psychrometric Properties
Heat Exchangers
Decibel Addition and Subtraction
Temperature Conversions
Pulmonary Functions/Vital Capacity
Lung Diffusion and Arterial CO_2 Normalization
Ventilator Setup and Corrections (Radford)
Blood Chemistry I
Blood Chemistry II
Body Surface Area for Cardiopulmonary Programs
Cardiac Outputs
Black Hole Characteristics
Special Relativity Conversions
Three Dimensional Special Relativity
Einstein's Twin Paradox
Delta-V-Orbit

Fittings
Valve Sizing
Pipe Network Analysis
Restriction Metering Orifice Calculations
Energy
Steady
Compressible
Variable Area
Flood Routing Hydrographs
Taping Reduct
Triangle Soluti
Aerial Photogra
Mapping Perce
Overlap Frame
UL2Con/Concrete Column Biaxial Bending
Calendar Date/Julian Date Conversions
Day of Year — Day of Week
Number of Weekdays Between Two Dates
In What Year is a Given Date an M-day?
Number of M-days Between Two Dates and the N-th Day of M
Holidays
Religious Holidays
Chinese Years To/From Gregorian Years
New Moon and Full Moon Day of Month
Calendar Printout
Straight Fin Efficiency
Conservation of Energy
Hydrocarbon Combustion
Heat Transfer Through Composite Cylinders and Walls
Von Karman Analogy for Heat and Mass Transfer
Dice
Installment Sales Method
Simplex Algorithm
Calendar Functions
Calendar Printout
Jewish Holidays
Acid Dissociation at Given pH
Amplifier Bode Plot and Solve
Molecular Weight Calculator
Straight Line Forced Thru Any Point
Resistor Color Code Chart
Conjugate Gradient Method Subroutine for Symm Matrices
Lubricant Prices — Read
Lubricant Prices — Load
Contract Bridge Scorer
Mass Produce Biorhythms Part 1 — Bio, Part 2 — Update
Triangle Solutions
System of 16 Equations in 16 Unknowns
Graphics Aid Program
Missing Number Division
Missing Number Subtraction
Missing Number Multiplication
Logic Through a Looking Glass
Direction Cosine Matrix
Rational Number Operations
Hearts Scorekeeper (With Output Labeling)
Blackjack Test Strategy 2 (With Output Labeling)
Fractions
Balanced Horizontal Traverse by the Compass (Bowdich) Rule
Natural Frequencies

Automated
Perpetual Calendar
Sales Quota
Time Tally by Category
ng P
zing
inear
on
ramin
sation
on by
s Rul
on
Double Riemann Sum
Taylor
Pulse
Radar
German sistor
Thermo
Interpo
Calibra
Single
Kinetics
Buy and ock
Market
Filtratio
Mwall/Masonry Shear Wall Design
Hazen-William's Equation for Flows, Head and Diameter
Heat Exchanger Optimization I
Circon/Circular Concrete Column Biaxial Bending
Point and Figure Charting Aid
Statistical Means
Electrical Transmission Line Calculations
41C Rectangular Corner Walls Calculations
41C Settling Velocities
Base Ten Conversions
41C Your Values
Length of Circular Arcs
Natural Frequencies of Uniform Beams
Modified Trapezoidal Integration
Sunrise, Sunset and Twilight from 1900
Mannings Equation for Flow, Diameter, Slope and Depth
Vapor-Liquid Equilibria Prediction
Thermodynamic Properties of Gas Mixtures
Yacht Racing Rules Judge
Wind Triangle
Cost of Paying Premiums More Frequently Than Annually
Custom Premium Calculation 2
Special Root Finder 1
Root Finding by Richmond's Method
Math — 1 Elementary Arithmetic Teacher
Volume and CG of a Hexahedron
Row Plot (High Resolution Plot)
Respiration
Sundial
Financial Calculations — Efficient Version
Alphanumeric to Numeric Conversion
Black Box
Control Cooling Tower Run Off
Aircraft Position
Typing Tutor
Binomial Distribution
Negative Binomial Distribution
Romberg Integration
Complete T Test
Algebraic Operating System
Powers of Two
Bubble Sort

Distance on Earth's Surface per FCC Rules
Invaders
Digit-Sum
t Test
odification
n Bertalanffy
rve
tion
elestial Sight
eduction
tbf Calculation from
Cost — Stochastic Model
Euler Phi Function
to All R
uation
al
on Va
Time S
Date Vernier
Stadia Reduction
Data Input (Store) and Review
Towers of Hanoi
Complex RPN
Conjugate Depth for Hydraulic Jump
Backwater Profile for Rect Trap or Triangular Channels
Critical Depth of Rect Trap or Triangular Channels
Open Channel Flow Triangular Rectangular Trapezoidal Channel
Potentiometric Titration of Weak Acid-Strong Base Simulated
Flight Planning and Management
Gear Frequencies
Product of Two General Matrices
Deflection of Beam with Variable Section
High Head Flow in Hydraulically Long Culverts — Pipes
Analysis of Conics with Invariants
Model Airplane Design — Radio Control Competition Patter
Wage Packet Organizer
Central Server Model of Multiprogramming
"Trap" Transient Response Analysis Program
Super-Dooper Mastermind
High Resolution Plotter
Islamic Calendar
Bermuda Triangle
Decimal to Binary
Motion
Act Financial Needs

Method
Field Population and Planter Calibration
Complex Gamma Function
vity by
netic
Induc
Maxi 0%
for Person
Incom
CD
Num
Conv
ssemble
Mnemonic Generator
Correlation Coeffi
version
Spinn
Calculation
Hypergeom
Distribution ng
ability
Pac Da
ries
stributi
Puzzle of Fi
Gamma Function; Fraction and Negative Values
Compressible Flow Functions for Air
Principal Stresses at a Point (Three Dimensional Case)
Aircraft Range
Lumber Invoicing
Computer Slope Staking
Vector Operations (Dot and Cross Products)
Space Hunt
Bearing Pile
Cubic Spline
Tafel Equation Fit
Calorimetry
Condensed Delta Storage
7 X 7 Dot Character Builder (Wand)
X-Register Manipulations
Hydraulic Design of Pipes and Channels
Contours
Poor Edward's Barcode Maker for Type 7 Barcode
Act Financial Analysis Independent Student
Percentiles and Percentile Ranks
Practical Signal Timing
Simple Janbu Analysis for Mohr Coulomb Material
Steel Baseplate Design Program — Columns w/or w/o Base Moments
Rallye Navigation
Orbit
Chi-Square Test for Independence on MxN Contingency Table
Curve Fit-Best Fit-

Offset Taping
Bio-Compatibility
Bin/Dec Conversions
Traverse, Inverse, Sideshots
ersed
cces-
D
rgy
of
mple ctivity (CH50)
sing Game
spos c
d Bo
l Transmission
Progr
m
erest
Tabulator Chain
Prompted Improved (Revision A)
Diesel Fuel Spray Penetration
Decline Curve Analysis
Saturated Steam Flow Through Pipe, Valves and Fittings
Wire Tables and Wire Use
Iterative Multiplication of Matrices
Numerical Quadrature of Unequally Spaced Ordinates W/SMO
Securities Evaluation
Math Baseball
BEOG/PELL Grant Eligibility Index
Astronomical Co-ordinate Systems
Modified Berggren Equation: Dept HS of Freeze or Thaw
Solar System Exposures for Astro-Photography
Heat Exchanger
Number Song
Perfect Mastermind
Hex/Bin/Dec Conversion Table
Visual Binary Star Orbits
Safety-Valve Steam-Flow Capacity
Microcalc
Lamsecon Local Authority Maintenance and Services Economics
Architectural

IRR%
Elev on VC or Tangent in Super Transition at Pts or Interval
Budget Shopper
ration
gn
Classification Analysis
s
rmance
Sorting
Interest
ns
esign
bject Search
Analysis of Variance of 2**n Full Factorial Designs
Spiraled Curve with Offset Baseline
Index
XYZ Tabular Data Entry and Linear Interpolation System
Design & Rating of Absorbers, Including Packed-Column Design
Long Transmission Lines
Land Survey Measurement
Federal Corporate Income Taxes 1981 to 1983
Pavecon: Plant and Vehicle Economics
Aerobic Points and Caloric Requirements for Running
Spherical
Fishing Bears
Rate of Return
Digital Filter
Rubik's Cube Solver
Simulation of Rubik's Magic Cube Inc a Complete Soltn Algor
Nicomachus
Beta Distribution
N-Complex Simultaneous Linear Equations
Beam on Elastic Continuous Support
Hebrew Typewriter
Lift and Drag Coefficients for a Supersonic Rhombic Airfoil
Right Angle Triangle Solutions — Automatic
Planetary Positions
Integration to Infinite
Aqueous Flow Simulation
Compton Crossections
Az-El Table Plus Astronomy Utility Routines
Solar System Exposures for Astro-

tion of Series and Polynomials
Multiple Linear Regression — Up Variables
Enduro
Quantity of Tiles Square Foot of Fl Space
Nails Per Pound/Kilogram
Resistive Pads
Rubik Cube Solu
Increasing Data Storage Efficienc
Glulam Board Footage
Frame Moment Distribution
Rally
Complete Christi Era Calendar
Septic Tank Volu and Absorption F
Checkers
Rule of 78's
Checkbook Track
Hexadecimal/Decimal/Binary Number Convers
Management of 2 Simultaneous Bar Accounts
Master Mind and Rubik's Cube in
Ten-Billion Year Calendar with Da Stack
Fast Fourier Transform II
Reinforced Squar Footing
Harm (Harmonic Analysis of a Peri Function)
Network Cost An
General CAM Program
Satellites of Jupit
Linear Elastic Pla Truss Analysis
Ingredients for a Batch
Statistic Calculat for the Blind
Single Plane Bala
Coastal Navigatio Two Bearings
Summing Amplif Design and Anal
Table Look-Up U the Lagrange Interpolating Polynomial
Typogenetics
Spline — Interpol — Package
High Pressure G Piping
Tide Calculation
Human Heat Str
Root Locus Generation
Statistical Compa of Epidemiologi Data
Reduction of Cir Diagram to Matr Eigenvalue Prob
Interpolation an Extrapolation
Precision Camer Image Sizing an Exposure Comp
Beam with Varyi Moment of Inert Stiffness, Fem, C
Modified Bergg Equation: Dept Freeze or Thaw
Thermodynamic Properties of a Substance from Critical Data
Properties of Hydrocarbons
Mastermind — S Version
Series-Parallel R Transient Respo
Chi-Square for General MxN Contingency Ta
Airfoil Coordina Interpolation
pH, Equilibrium Chemistry and

Fact: No other calculator offers so much software. Over 2500 HP Series 40 software programs run on the HP-41CX.

The HP-41CX.

To get ahead, you've got to push the right buttons.

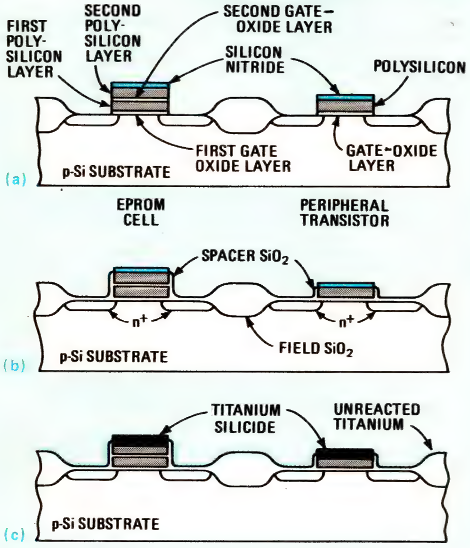
HEWLETT PACKARD

Chronology of a megabit EPROM

It is instructive to follow—through successive papers delivered at technical conferences—NEC's two-pronged development effort that is finally nearing its goal of a 1-Mb electrically programmable read-only memory. NEC engineers proved out the silicidation technology on a relatively small-scale EPROM with large line widths, while concurrently developing a 1-Mb fine-pattern prototype.

At the 1983 Symposium on Very Large-Scale Integrated Technology, in Maui, Hawaii, titanium silicidation applied to a 64-kb EPROM was described together with simulation of a 1-Mb chip. Experimental circuits showed that characteristics were not degraded, while simulation of a 1-Mb circuit indicated that Ti silicidation would provide a 30% speed gain for EPROMs fabricated with 1.2-μm design rules.

Then, at last February's International Solid State Circuits Conference in San Francisco, the same group described a 1-Mb EPROM with stacked polysilicon gates fabricated on a chip measuring 9.4 mm by 7.2 mm. Minimum gate poly length in the memory cell area is 1.2 μm, while that in the peripheral circuits is 1.5 μm. The high resistivity of the polysilicon gates and word lines slows access time to 180 ns, despite the inherent high speed of the fine-pattern geometry. The latest chip was described at the 1984 VLSI symposium in San Diego. –C.L.C.



Process for speed. In NEC Corp.'s titanium-silicidation process, the gates are dry etched (a). Arsenic ions are implanted for drain and source (b), after which SiO_2 is grown, using silicon nitride film as a mask. Finally, a titanium film is deposited (c), and the unreacted titanium is dry etched away.

circuits avoids short-channel effects.

For both the downsized chip and the earlier chip, the thickness of the oxide under the memory cells' first gate is 300 Å, while that under the second gate of the cells and those of the peripheral circuits is 350 Å. In order to achieve high-speed and low-power circuits, the firm used ion implantation to fabricate three kinds of transistors with different threshold voltages: enhancement, shallow depletion, and depletion (see figure).

NEC scientists opted to use silicidation of titanium for this chip because it is the most convenient material system for an EPROM. Such ICs require the first gate to be completely surrounded by silicon dioxide for low leakage.

This is done by first dry etching the polysilicon for the first and second gates using silicon nitride and photo resist as a mask. Arsenic ions are then implanted in drain and source regions and driven in. Then thermal oxide is grown on both regions and on the sides of the double-layer polysilicon gates, using silicon nitride film as a mask. The final processing step is the deposition of a 600-Å titanium film on the chip. The film is then reacted with the exposed polysilicon gates and word lines, and the unreacted titanium over the rest of the chip can be selectively wet etched away. –**Charles L. Cohen**

TEXT PROCESSING

LSI optically segments page

Louvain-la-Neuve, Belgium—In tomorrow's paperless office, the ubiquity of high-speed printers will make the production of printed documents as simple as the touch of a button. But potential snags in both processing and storage could make the use of documents as inputs—particularly those consisting of combinations of text, graphics, and halftones—a far less straightforward operation.

Engineers at the microelectronics laboratory of the Université Catholique de Louvain have developed a system that sidesteps this problem. Their new programmable, custom large-scale integrated circuit can automatically divide a page into regions of text, graphics, and gray-scale images so that appropriate coding techniques can be applied to each zone.

The circuit is the key element in a dedicated processor system consisting of a standard Advanced Micro Devices Inc. Am2910 control unit and the laboratory's custom IC. Both of these interface with a 68000 microprocessor by way of a VMEbus.

In operation, the microprocessor sequences algorithms at a high level, while the custom IC performs the highly repetitive tasks that are necessary for analysis. The system can carry out such instructions as block segmentation, character segmentation based on contour detection, histogram determination, and black-pixel-density determination, as well as certain Boolean functions.

Optical character segmentation is an essential function in text processing. The process not only results in a high data-compression ratio to ease storage requirements, but also opens up the possibility of going beyond simple document storage, where an optically processed text is handled in the same way as a keyboard-entered text. The Louvain team estimates that the system based on their custom IC performs character segmentation at a speed of 500 characters/s, which is 10 times faster than the same function could be implemented in an assembler on a 68000 microprocessor.

Prototypes of the 10,000-transistor circuit were realized in Louvain's 6-μm n-MOS technology. The circuit was presented in performance last week in Edinburgh, Scotland, to the 10th European Solid-State Circuits Conference by Louvain professor Paul Jespers and his colleagues Jean-Didier Legat and Pierre de Muelenaere. **–Robert T. Gallagher**

CELLULAR RADIO

Chip set foils eavesdroppers

London—As cellular radios and cordless telephones gain wider use among consumers, maintaining the privacy of conversations carried on these systems will become more important. One small British chip maker, Consumer Microcircuits Ltd., thinks it goes a long way toward solving this problem with a new line of speech-privacy circuits, due out in the first and second quarters of 1985.

The Witham, Essex, company can satisfy the need for privacy with a single package that contains a combination of integrated circuits, maintains marketing manager Leslie Litwin. When installed in a cellular radio's transmitter and receiver, this package can be programmed to provide two levels of privacy. To the eavesdropper, the circuit combination garbles speech by scrambling the voice spectrum and inverting vocal high and low frequencies.

Frequency-inversion scrambling is easily accomplished with the aid of a double-balanced modulator circuit. The widely used technique relies on the fact that the modulator's upper sideband output is a mirror image of its lower sideband. For example, in Consumer Microcircuits' speech privacy system, the voice spectrum is split in two by a bandpass filter arrangement and each segment is inverted by a modulator before being recombined. At the receiver, the two segments are separated by a bandpass filter, reinverted, then recombined with no loss of speech quality.

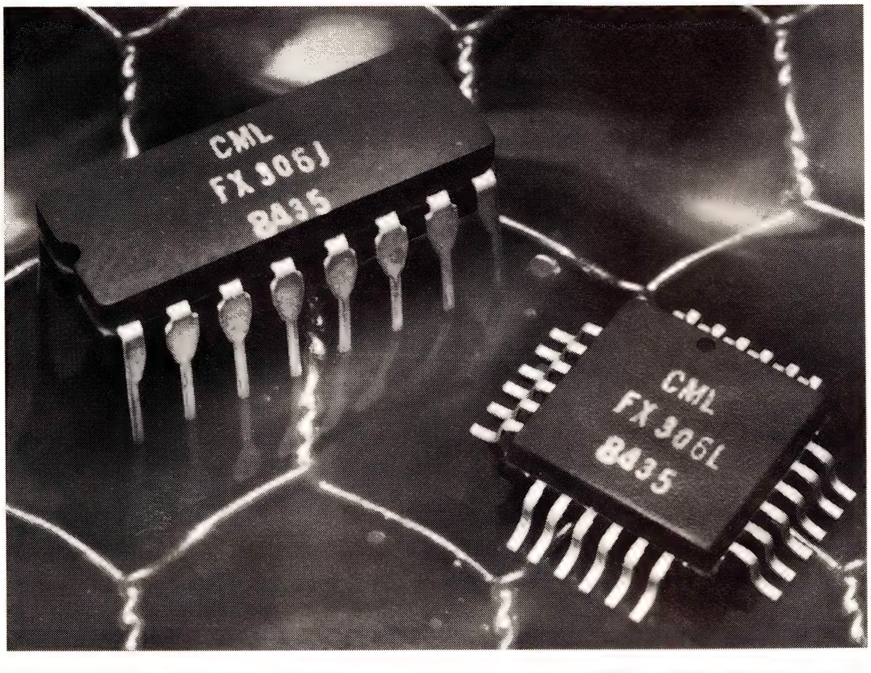
If greater privacy is required, a single-chip microcontroller can be added to the speech-privacy circuit in the mobile terminal and in the base station. The band-segmentation frequency can then be switched around in a repeating sequence or rolling code, making it even harder to eavesdrop. The band-segmentation frequency (the frequency around which inversion takes place) can be set at any of 256 levels, defined by an 8-bit parallel word input on the basic speech chip. Transmitters and receivers are kept in step by a synchronizing tone burst.

Fancy features. Also in the works at Consumer Microcircuits are single-chip modems and filters that will add frills to basic cellular-radio models or simply cut their component count and, hence, their size, power consumption, and cost. For example, one IC in the filter chip set implements the entire receive-path filtering function, while a second integrates the transmit-path filters.

These switched-capacitor filter arrays are designed in complementary-MOS technology, run off a single 5-V supply, and have a power-down mode that further cuts current consumption, from an active 2.6 mA to a standby 0.32 mA. Because of the chip set's canny filter design, the firm can meet the different systems specifications for mobile phones in the U.S., the UK, and Scandinavia.

The firm's FX 306 transmit-path filter IC integrates an audio bandpass section, a six-pole low-pass filter with a 3,400-kHz cutoff, and an uncommitted inverting amplifier that, with the addition of an external RC combination, can be used to apply pre-emphasis or de-emphasis.

The FX 316 receive-path filter includes the same functions but adds a bandpass filter to extract whichever supervisory audio signal is used in a country's cellular-radio standard. A 4-kHz notch filter is cascaded with the speech-band filter to block the supervisory signal's entry into the speech path circuit. **-Kevin Smith**

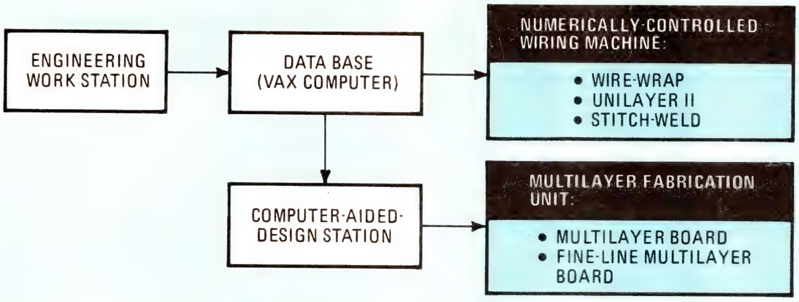


Privacy. Consumer Microcircuits Ltd.'s line of ICs scrambles the voice spectrum by inverting frequencies to keep conversations private on cellular radio systems.

PRODUCTION

Board maker links to work stations

Attleboro, Mass.—Despite their considerable recent advances, computer-aided-engineering work stations have lacked the necessary tools to integrate a CAE data base to a printed-circuit-board prototype line. As a result, the design cycle for boards has been stop and go. Some aspects are are highly automated, but the cycle


ENGINEERING WORK STATION
DATA BASE (VAX COMPUTER)
NUMERICALLY-CONTROLLED WIRING MACHINE:
• WIRE-WRAP
• UNILAYER II
• STITCH-WELD
COMPUTER-AIDED-DESIGN STATION
MULTILAYER FABRICATION UNIT:
• MULTILAYER BOARD
• FINE-LINE MULTILAYER BOARD

Integrated. Augat's interconnection system integrates multiple technologies to provide engineers with the tools needed to get their pc-board designs manufactured faster.

is slowed while the designer searches for a vendor with a compatible data structure to manufacture his design.

Now comes a concept, from Augat Inc.'s Interconnection Systems Group, designed to integrate pc-board fabrication and the engineering work station. Augat, which previously served the Wire-Wrap portion of the market, is a short-run-production manufacturer offering both integrated software and services for a range of technologies including Wire-Wrap, surface-mounted discrete wiring (Unilayer II), multilayer boards; stitch-weld, and fine-line modules from its Microtec subsidiary.

Five technologies. The system integrates the design engineer's work-station tools with Augat's data base, which covers five packaging technologies and a manufacturing facility. Working closely with CAE work-station software, Augat says, its system can pick up the work station's data base and convert it to the design and manufacturing data base of the VAX computers that control its system (see figure). The conversion is transparent to the user.

The system's main features are quick, convenient, error-free transmissions and its ability to select the optimum wiring system for each designer, says Larre H. Nelson, Augat's program manager. "Pieces [of the system] have been together for six to eight months," he explains, adding that Augat currently has 20 customers hooked up for electronic transfers. He estimates that the system will be fully operational in two to three years.

Opening a market. Philip Plonski, the vice president at Kollmorgen Corp.'s Multiwire Division, in Hicksville, N.Y., says the firm's competitor was correct in identifying a need for integration. "If the market accepts the tool, it could open things up for the entire industry," he says.

Data may be transferred to Augat in one of three ways, Nelson says. If it is transferred on paper—schematics, coding forms, and so forth—Augat's customer engineers will convert the data to electronic form for a tooling fee. In addition, data can also be transferred by mailing floppy disks or magnetic tapes to Augat's facilities in Attleboro or in Houston. Finally, it may be electronically transferred using the VT-100 emulation programs found on most CAE work stations.

Asked about cost, Nelson emphasizes that without the Augat system, data checking and keying for a pc-board design can cost as much as $1,000. "It's a very labor-intensive and error-prone procedure," he explains. By comparison, the Augat system has a one-time setup fee ranging from $25 to $50. Using the example of a standard 8-by-8-in. VME board in quantities of 100, he estimates the cost would be $230 for a standard Wire-Wrap board, $107 for Unilayer, and $70 for Multilayer boards. **–George Leopold**

AVIONICS

Air Force seeks control system that keeps damaged plane flying

Wright-Patterson AFB, Ohio—If the U.S. Air Force has its way, future jet fighters that are damaged in combat will be able to reconfigure themselves to keep flying, even after extensive damage to wings or control surfaces. This is one goal of a program, set to kick off next month, to develop a self-repairing flight control system.

Up to a dozen contracts will be awarded during October and November in the first phase of this $25-million, five-year effort to develop and demonstrate the technology, says Duane P. Rubertus, laboratory technical manager for the project at the Aeronautical Systems Division's Flight Dynamics Laboratory here. Although as many as 12 separate contractors could be involved with the project initially, that number will be pared down to perhaps three to five contractors within a year. This team will then work to develop the system planned for first flight testing in an Air Force fighter by 1987, Rubertus says.

Many current fighter planes, inherently unstable and dependent on a computerized digital flight control system, can be devastated by a direct hit. "A pilot can lose control in less than a second," Rubertus observes.

"Say you lose one side of a stabilator on an F-16 tail. In ordinary circumstances, the control problem is so difficult that even the most experienced pilot would not have time to take all the actions necessary to regain control before the aircraft crashes, even if he knows what those actions are supposed to be."

New software. One goal of the project is to develop software to enable the plane's flight control computer to make necessary control modifications automatically, Rubertus explains. If an essential flying surface is damaged, the computer would instantly reconfigure other control surfaces to compensate for the reduced capability.

In current systems, a pilot whose aircraft has been damaged receives only negative information; he is notified that something on the plane has

How to make a machine act like man's best friend.

Feed it NEC's voice recognition chips.

Busy people want their electronic helpers to spring into action the instant they hear the master's voice.

That's what voice recognition is all about. The user speaks. The machine recognizes his voice and executes his command. Interface is effortless, natural, completely on the user's terms.

And voice recognition is now an affordable option for your product. With NEC's 3-chip voice recognition set. Integrate it in personal and business computers, word processors and commanders, data loggers. The applications are endless, the market potential explosive.

COMPRESSED DP MATCHING.

NEC is a leader in voice recognition. Our economical 3-chip set forms the core of a speaker-dependent, isolated-word recognition system. Referring to voice patterns in an external 16K-byte memory, the chips respond to 128 words. More memory gives you more vocabulary: up to 512 words. Efficiency and accuracy are enhanced by NEC's exclusive compressed dynamic programming matching system.

It's a snap to interface the chips with host computers or processors. And it only takes a few commands to make the host computer execute voice registration, recognition, data transfer and other functions.

FORMANT VOICE SYNTHESIS CHIP.

If you want your machine to talk, feed it our μPD7752AC chip. Utilizing formant parameters from the vocal tract, this CMOS chip provides efficient voice synthesis at a sensible price. It includes a 9-bit D/A converter and a 32K bit ROM for 21 seconds of clear, crisp speech. Digitized at a bit rate as low as 1.5kbps.

External ROMs let you synthesize as many messages as you want. Bus-compatible with the 8080A family, the chip can also be connected with other microcomputers via serial interface.

MAKE THE MARKET PERK UP ITS EARS.

Whether you're talking design, price or end-user appeal, NEC voice chips have the answer. So give your product the power of the verbal communication. And watch the market perk up its ears.

NEC Electronics Inc.
401 Ellis Street, Mountain View, CA 94043.
Tel: 415-960-6000. TWX: 910-379-6985.

NEC Electronics (Germany) GmbH
Tel:0211-650302. Telex:8587419 NEC D.

NEC Electronics (UK) Limited
Tel:0698-732-221. Telex:777565 NEC UKG.

NEC Electronics (France) S.A.
Tel:1-609-9004. Telex:203544 NEC EF F.

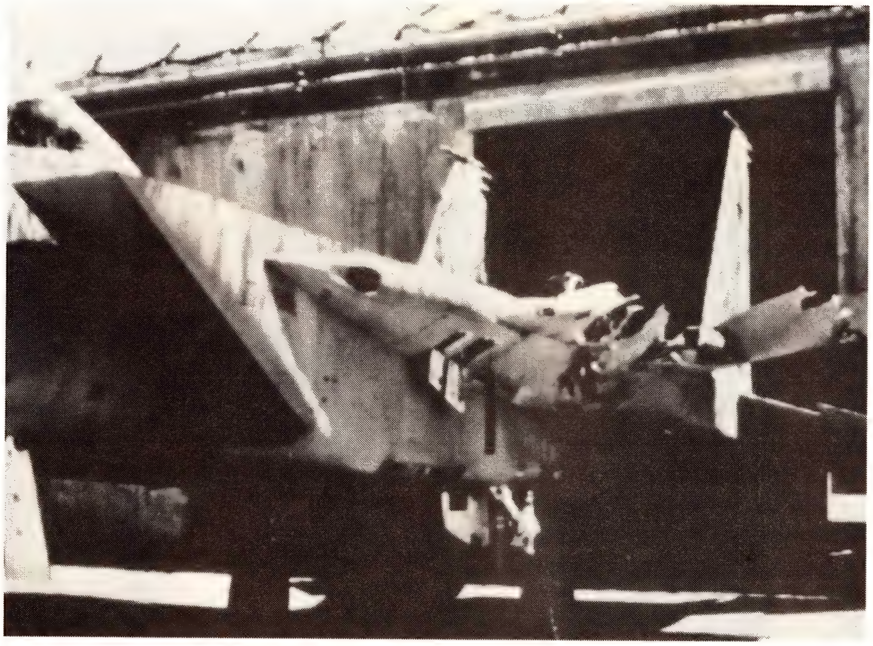
NEC Electronics Italiana S.R.L.
Tel:6709108. Telex:315355 NEC EIT I.

NEC Hong Kong Limited
Tel:0-242-824/7. Telex:84561 HK NEC HX.
Taipei Branch: Tel:02-522-4192, 522-4258.
Telex:22372 HK NEC TP.

NEC Singapore Pte. Ltd.
Tel:4819881. Telex:NECSIN RS 39726.

NEC
NEC Corporation
Tokyo, Japan

Circle 31 on reader service card



Informative. A self-repairing flight-control system would provide new flight information to a pilot, enabling him to bring back to base a badly damaged plane, as did the pilot of this F-15.

failed and is left to determine the effect on his own, Rubertus says. The self-repairing flight control system will aid the pilot by providing him with more useful information about what the plane is still capable of doing. By displaying information such as a plane's reduced range caused by added drag, for example, the system will help the pilot determine which plan to pursue.

Reduces maintenance. While such a system would pay dividends in making a fighter plane harder to shoot down, the concept is also expected to pay off by reducing aircraft maintenance costs. With today's planes, any single warning of possible problems with the flight control system must be checked out by maintenance before the aircraft can be flown again, because failure of a single actuator could be fatal in flight. But in many instances, a problem that triggers a warning or alarm in flight cannot be duplicated on the ground, which can lead to unnecessary repairs and sometimes failure to isolate the problem, Rubertus says.

As part of the self-repairing flight control system program, the Air Force hopes to make planes more easily and quickly repairable by using artificial intelligence techniques. Included in the software requirements for the project are provisions for automated maintenance diagnostics based on expert systems that will enable maintenance personnel to zero in more quickly on the likely cause of a problem.

In addition, a self-repairing flight control system will minimize the need to build in additional control surfaces or redundant mechanical gear, thereby helping to increase performance by holding down weight. "What we're trying to do is trade off complexity in the actuators and other mechnanical systems with software," Rubertus explains.

Though he can provide no estimates of the number of planes a self-repairing flight control system could be expected to save in combat, the improved maintenance goals for the project are more calculable. Right now, the mean time between failures for flight control systems on advanced aircraft such as the F-15 and F-16 is in the neighborhood of 30 to 40 hours, and the mean time between maintenance is about 10 to 20 hours, he says. With the new system, the Air Force hopes to increase MTBF to between 300 and 400 hours, with improvement in MTBM to between 210 and 280 hours. Similarly, the system could be expected to reduce the number of maintenance hours per flight hour from its current 1:1 ratio to about 1:5.

Lifetime saving. In all, the system could reduce the overall life-cycle cost of an aircraft's flight control system by about 30%, including the cost of acquisition, operation, and support. For a fleet of 300 planes operating over their 15-year lifetime, this reduction could amount to a total savings of about $300 million, Rubertus says.

Contracts for the self-repairing control system will proceed in phases that call for demonstrating the critical technologies before full-scale development begins. Before the system's projected 1987 test flight in a fighter plane, it will have been tried out on both laboratory flight simulators and appropriately modified testbed aircraft. Design of the self-repairing flight control system models will be generic, with the hope that the technique could also be applied to bombers and cargo aircraft.

–Wesley R. Iversen

RESEARCH AND DEVELOPMENT

Japanese firms boost spending for short-, long-term projects

Tokyo—There's a research and development boom going on in the Japanese business world, and the country's major electronics companies are among the largest noisemakers. Six of the top 10 R&D spenders for fiscal 1984 are in electronics: all told, the Japanese electronics industry will spend close to $4.6 billion—15.7% more than a year ago.

Most of that money is going toward near-term or intermediate goals, such as the development of 4-Mb memories and custom single-chip systems. But an increasing percentage of research funds is being targeted for what the Japanese call 21st Century technology. These futuristic projects include the development of amorphous alloys for switches and

An Alternative for Advertisers to Reach Design Engineers

Editorial:

Computer Systems Equipment Design is devoted entirely to international coverage of the computer segment of the electronics industry. It is produced by a team of experienced technical editors dedicated to providing readers with the most complete and accurate technical information available. A typical issue includes detailed technical articles focusing on significant trends or techniques authored by industry experts, provides in-depth technical articles and introduces new products.

Circulation:

25,000 qualified electronic design engineers specifically responsible for the design and manufacture of computers and computer systems, worldwide.

1984 Special Introductory Rates:

Ad size	ElectronicsWeek advertisers	Non ElectronicsWeek advertisers
1 page:	$1,000	$1,500
2/3 page:	750	1,125
1/2 page:	620	930
1/3 page:	400	600
1/4 page:	320	480
1/6 page:	220	330
Cover rates		
4th cover:	2,160	2,635
3rd cover:	1,710	2,260
2nd cover:	1,810	2,410
Color charges:		
Two color, standard:	305	
Matched 2nd color:	510	
4 color process:	610	
4 color process spread:	950	

Issue and Closing Dates:

Issue dates	Closing Dates
Premier Issue	
September 1, 1984,	August 1, 1984
November 1, 1984	October 1, 1984

No Waste Circulation:

Computer Systems Equipment Design is a targeted and cost-efficient way to get your advertising read by computer and computer systems design engineers, worldwide.

For space reservations, call Production Dept.,
McGraw-Hill Electronics Publications,
(212) 512-3140,
1221 Avenue of the Americas,
New York, N.Y. 10020.

Plenty FAST.

In 1978 Fairchild promised you a full family of high-speed, low-power FAST™ logic. And we meant it.

Today, over 50% of the entire FAST family is already introduced and in stock. And more of the 166 functions are being approved each month. Millions of units are being produced each month.

We'd be happy to send you the new FAST poster listing all the FAST functions. We have plenty. See your nearest sales office or distributor.

FAIRCHILD
A Schlumberger Company

Fairchild Digital Products Division, 333 Western Avenue, South Portland, Maine 04106
FAST (Fairchild Advanced Schottky TTL) is a trademark of Fairchild Camera and Instrument Corporation.

Circle 33 on reader service card

MORE FOR LESS... The Carley Lamp Reflector Assembly allows up to 300% more forward light without any wattage increase. The Reflector's elliptical design focuses light directly to the target. The beam can be prefocused to your specifications. The Reflector Assembly also acts as a heat sink thus dissipating heat away from critical components. Fits all Carley gas-filled lamps and can be designed to meet your needs. Carley has Gas-Filled Stiff Pin lamps in sizes T-1 thru T-2½. Write or call for free brochure and learn how to get 'more light for less.'

CARLEY LAMPS Creators of Hi-Intensity Sub-Miniature lamps
1502 West 228th St., Torrance, CA 90501
(213) 325-8474

Circle 99 on reader service card

sensors, X-ray lithography for ¼-μm production, and molecular electronics, including the development of organic semiconductors, or biochips.

Although the scale of individual company investments does not rival that of a giant such as IBM Corp. (Hitachi Ltd. is Japan's No. 1 R&D spender this year with $875 million, compared with IBM's 1983 spending of $3.6 billion), the increasing emphasis is impressive.

"We are spending 6.3% of total sales on R&D, a 20% increase over 1983," says Kiyoshi Nagai, director and general manager of Toshiba Corp.'s Research and Development Center, in Kawasaki. "Six years ago, we had just three laboratories and a total research staff of 1,800. Today, we have six working labs, a manufacturing engineering lab, and our new VLSI research center"—opened in January at a cost of close to $100 million. Meanwhile, Toshiba's R&D staff has grown to nearly 3,500.

Driving interests. Two basic elements—money and fear—are fueling this intensified drive toward both short- and long-term research.

Impressive profits during the past two years have enabled most firms to step up their R&D activities. Recent fiscal reports from major electronics manufacturers reveal, for example, that Matsushita Electric Industrial Co., Osaka, expects a consolidated net income this year of $917 million, up 21% over last year. Japan's largest computer maker, Fujitsu Ltd., Tokyo, reports a 28.4% gain in computer and peripheral sales for fiscal 1983, with consolidated net income up 38.1% to $278 million. Fujitsu predicts 17% growth this year. NEC Corp., Tokyo, which had a 34.9% rise in net income last year, estimates a growth of 19% for all of this year.

The fear behind Japan's R&D boom is from the lingering shock of the IBM-Hitachi computer-software affair, in which IBM accused Hitachi of stealing trade secrets. The settlements accepted by Hitachi and other IBM-compatible makers in Japan in an out-of-court agreement [*Electronics*, Nov. 3, 1983, p. 75] has shown firms here that independent product development is a safer path.

It is also more expensive. But Japanese research teams have a formidable supporter: the Ministry of International Trade and Industry. To spur research and relieve some of the burden of R&D investment, MITI has drafted a new proposal to form a special state corporation funded by the government-run Japan Development Bank. To be set up next year, it would offer low-interest loans equal to the low government-fund loan rate (currently 7.1% a year) available to private companies undertaking high-tech research.

Increasing. Toshiba Corp.'s R&D spending is up 20% over 1983, notes Kiyoshi Nagai, director of the firm's R&D center in Kawasaki.

Consolidation. The new organization also would consolidate and coordinate the nine R&D laboratories currently operated by the Agency of Industrial Science and Technology, which is under MITI administration. According to the present law, the labs cannot engage in joint research with private corporations. This ban would be lifted, and joint ownership of patents resulting from joint research would be permitted, with 50% of the private-sector profits resulting from such research going back to the government.

MITI also is proposing two new tax laws to increase the 20% tax credits on R&D expenditures to 30% on most projects and to as high as 50% of the cost of basic research, including new industrial materials.

Even without such government help, major makers are expanding research facilities and staff. Matsushita, which is already the largest consumer electronics firm in Japan, will open an $83 million semiconductor research laboratory adjacent to its central laboratory in Kadoma, a

JAPANESE FIRMS' SPENDING ON RESEARCH AND DEVELOPMENT
(FISCAL 1984)

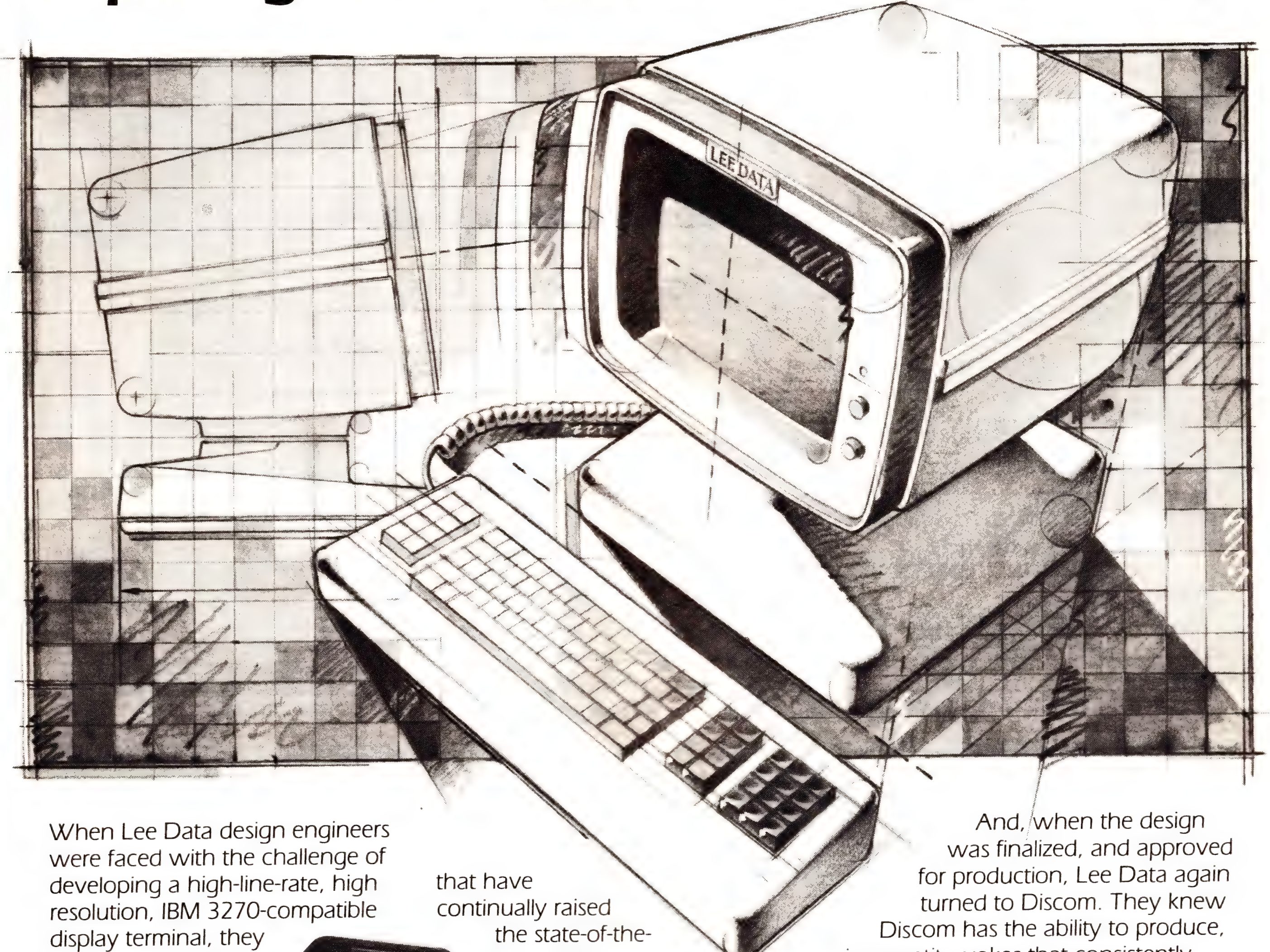
Company	Amount (millions of dollars*)	Increase from previous year (%)
Hitachi Ltd.	875	12.9
NEC Corp.	792	18.8
Toshiba Corp.	625	20.0
Fujitsu Ltd.	500	21.0
Matsushita Electric Industrial Co.	500	10.4
Mitsubishi Electric Corp.	375	9.8
Sharp Corp.	202	14.1
Sony Corp.	185	8.4
Matsushita Communication Industrial Co.	112	24.4
Victor Co. of Japan Ltd.	104	13.0
Matsushita Electric Works Ltd.	90	5.9
Sanyo Electric Co.	89	16.1
Tokyo Sanyo Electric Co.	85	29.6
Oki Electric Industry Co.	83	29.9
Fuji Electric Co.	80	10.3
Sumitomo Electric Industries Ltd.	62	15.4

*$1 = 240Y

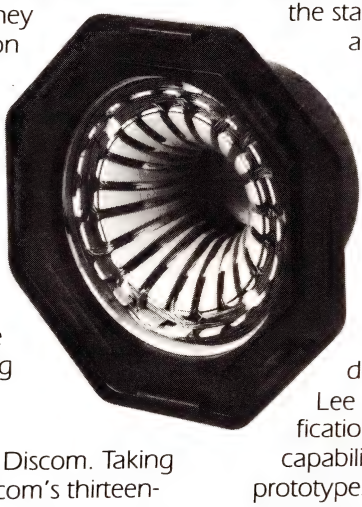
Source: Nihon Keizai Shimbun survey and *ElectronicsWeek* estimates.

THE CHALLENGE:

Develop a volume production yoke with geometry tolerance of less than 1% requiring no recorrection after assembly.



When Lee Data design engineers were faced with the challenge of developing a high-line-rate, high resolution, IBM 3270-compatible display terminal, they knew the deflection yoke would be a key component. They would require a yoke with geometry tolerance of less than 1% in production quantities. A yoke that would not require recorrection during final assembly in their plant.



So they turned to Discom. Taking advantage of Discom's thirteen-plus years developing components that have continually raised the state-of-the-art in display technology, Lee Data engineers were able to realize their objectives.

Using Discom's patented non-uniform conductor distribution process, Discom engineers developed a specially designed yoke to meet Lee Data's exacting specifications. Then Discom's full-capability prototype lab built prototypes for testing and evaluation.

And, when the design was finalized, and approved for production, Lee Data again turned to Discom. They knew Discom has the ability to produce, in quantity, yokes that consistently and uniformly meet design specs.

In VDT applications, as well as avionics and large-screen graphics, Discom is helping the world's largest electronics manufacturers meet their design challenges. And often saving them time and money in the process. Circle the number below on the reader response card, or call (617) 692-6000 and challenge Discom.

Discom

Display Components, Incorporated
334 Littleton Road
Westford MA 01886

. . . challenging the limits of technology.

Circle 35 on reader service card

suburb of Osaka, next fall.

Sanyo Electric Co., Tokyo, which is forecasting net profits this year of $114 million, up 18% over 1983, has invested $21 million in a research institute at Tsukuba, northeast of Tokyo, site of a university where several advanced technology research projects already are under way. That facility will open next autumn as well. Hitachi has also chosen Tsukuba as the site of its basic research laboratory, to open in early 1986.

Victor Co. of Japan Ltd., Tokyo, is spending $42 million to build an R&D center adjacent to its Yokohama plant. Priority projects at the center will be advanced signal-processing computers and signal-measuring systems.

Challenging. More than money and enthusiasm will be needed for these investments to pay off. But Michiyuki Uenohara, executive vice president and director for research at NEC, is confident that Japan can meet "the challenge to create new technology." The most difficult aspect of this challenge, he adds, is software development.

Close to one quarter of all NEC research is in its computer and communication systems laboratory, where software-development is a priority. NEC also established a software production technology laboratory five years ago. Uenohara says that 25% of NEC's total research staff is engaged in software-related work.

Uenohara disagrees with critics who say a lack of creative ability will stymie further Japanese technological progress. He argues that developed technology has enough potential "to take us into the 21st century.

"[Japan] doesn't need a lot of geniuses. The proper percentage of researchers is 95% on short- to mid-term [work], and 5% on long-term [projects]. Right now, our ratio is about 97:3. We need to increase that slightly, but the graduates we are getting from university are more than adequate. We don't want them to work too much on university projects. We want to train them in our company, where the really advanced work is taking place." **-Mike Berger**

GOVERNMENT

EIA, AEA seek export leverage through telecom-gear tariff rise

Washington—As far as foreign trade is concerned, some U.S. electronics companies want to force the government to take off the kid gloves and get tough. To do this, these firms—through their two large and influential trade groups, the Electronic Industries Association and the American Electronics Association—have united behind a bill that would jack up tariffs on telecommunications equipment imports by 35% if foreign nations fail to make progress in opening their markets to U.S. suppliers over three years.

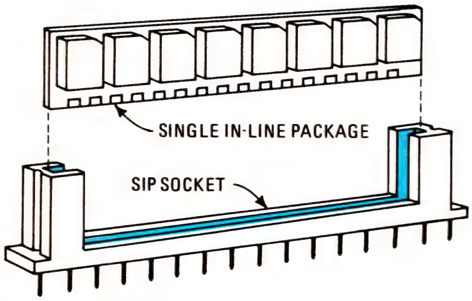
But though the Reagan administration agrees something must be done to head off the growing telecommunications trade imbalance, it warns that the bill's passage could produce a backlash overseas.

Sen. John C. Danforth (R., Mo.)

Single in-line package sheds its leads

The mixture of memory packaging concepts has given birth to yet another form of using high-density dynamic random-access memories. This time it comes in a variation of a single in-line package that carries up to nine surface-mountable dynamic random-access memories on one side of a 3.45-in.-long motherboard. The new leadless variation is designed to mount in a socket; existing SIP modules have through-hole pins [*Electronics,* July 14, 1983, p. 50].

SIPs conserve on printed-circuit board space by holding chips in a stand-up position, rather than flat on the board, thus packing eight times the storage of conventional memory packages. The leadless socketable versions, which have plated pads instead of pins, bring an added advantage: easy field upgrade of equipment by plugging in new memory modules.

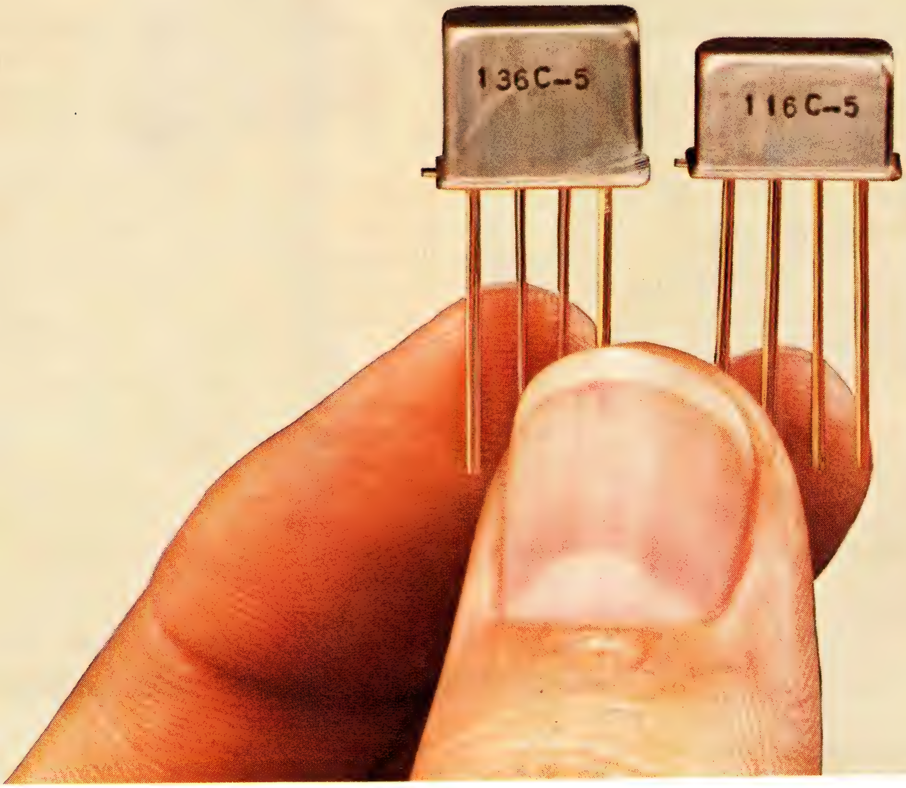


Not yet an announced product, the socketable SIPs are being shipped by Texas Instruments Inc. to Wang Laboratories Inc., of Lowell, Mass., the prime backer of the concept. For more than a year, the Dallas-based chip maker has been supplying through-hole SIPs to Wang.

TI's memory operation in Houston is now mounting nine 64-K DRAMs on socketable SIPs, forming 64-K-by-9-bit modules. Modules sporting 256-K chips and 256-K-by-9-bit storage can be plugged into the same socket, allowing for quick density upgrades in the field. Furthermore, Wang and TI are considering compatible 1-megabit-by-9-bit SIPs, once the RAMs become available.

Supplying sockets to Wang are Amp Inc. of Harrisburg, Pa., and Molex Inc. of Lisle, Ill. "Ease of replacement is the number one reason for the interest in socketable SIPs. It gives a very small field-replaceable unit [compared to socketable chip-carriers]," says Roger Fisher, strategic marketing manager for the MOS memory division. "Other advantages are that you can build systems with 64-K-by-9-bit modules and upgrade them in the field by a serviceman or representative." **-J. Robert Lineback**

Now the world's first CMOS compatible EMR is QPL approved.



For the first time you can drive an electromechanical relay directly with the signals of most logic families—including CMOS. That means simpler board layout problems and reduced components counts for greater reliability.

The new Centigrid® relay incorporates a power FET driver in the input to amplify the signal, protects it with a large Zener diode, and packs it all together with a DPDT relay and coil suppression diode in a tiny CENTIGRID style can. And make no mistakes... it is a Centigrid relay granted QPL approval to MIL-R-28776/6 and /7. Its ruggedness and proven contact reliability are industry bywords.

Ultraminiature Centigrid relays have proven extremely effective in applications where high board density and close board spacing are critical. Low power requirements make them exceptionally valuable for battery operation, and they have excellent RF characteristics up through UHF.

The new Centigrid is available in both general purpose (116C) and sensitive (136C) versions. Call or write today for complete information or applications ideas.

TELEDYNE RELAYS
Innovations In Switching Technology

12525 Daphne Ave., Hawthorne, California 90250 • (213) 777-0077
U.K. Sales Office: Heathrow House, Bath Rd., Cranford, Hounslow, Middlesex, England TW 5 9QQ • 01-897-2501
European Hqtrs.: Abraham Lincoln Strasse, 38-42 • 6200 Weisbaden, W. Germany 06121-7680
Japan Sales Office: Nihon, Seimei Akasaka Building • 8-1-19 Akasaka, Minato-Ku Tokyo, 107 Japan (03) 403-8140
France Sales Office: 85-87 Rue Anatole-France • 92300 Levallois-Perret, France • 758-71-60

Circle 37 on reader service card

Counterattack. John J. McDonnell, EIA telecom vice president, says a new Senate bill is needed to fend off the rising protectionism in Europe.

insists his proposed legislation, S. 2618, is not protectionist in nature. Rather, it aims to create a bargaining chip by giving the president leverage to negotiate more equitable bilateral or multilateral telecommunications trade agreements, he says.

Trade gap. Unprecedented nonreciprocal opportunities, notably in cellular radio telephones, for foreign companies to tap U.S. markets resulted in the nation's first negative telecommunications trade balance last year, argue the bill's supporters. While U.S. exports rose $87 million to $1.54 billion, imports grew by $834 million to $1.94 billion, according to Bureau of Census data.

That $400 million gap compares with a U.S. telecommunications trade surplus of $347 million just last year. By 1988, the Office of Special Trade Representative sees a $1.4 billion deficit, an estimate it labels as extremely conservative.

Current developments in the cellular radio business show why S. 2618 is needed, Motorola president John F. Mitchell told a recent Senate Finance Committee hearing. Ten months after the Federal Communications Commission approved cellular technology for use in the U.S., Japanese makers of subscriber car telephones outnumbered their U.S. counterparts by almost 3 to 1. They can supply 100% of the market needs, and they have cut prices to half those charged by U.S. firms.

In Japan, cellular systems have been around since 1979, but only in mid-1984 did Motorola win a cellular contract there, notes Mitchell. "It may be too late for S. 2618 to open markets for U.S. cellular radio manufacturers, but it certainly can help in other areas."

Bad as the situation is in Japan, it appears to be worsening in Europe, argues John J. McDonnell, vice president of EIA's telecommunications group. McDonnell is particularly concerned over a European Economic Community initiative to harmonize standards and thereby give European producers a continent-size market with corresponding economies of scale. Under this new system, "U.S. products will be excluded from the EEC market as they now are from the markets of individual member states," he says. Market observers note that public telephone authorities in Europe are notorious for procuring almost all their needed equipment from domestic sources.

Backlash. But not all electronic makers are supporting S. 2618. The Computer Business and Equipment Manufacturers Association, for one, fears passage will cause other countries to retaliate with measures that will hurt U.S. firms' overseas operations. "Frankly, IBM is scared to death" that the EEC will take action against its subsidiaries by placing even more restrictions on the scope of their selling activities, notes one commerce department official who asked not to be named.

Overall, the administration is worried that countries will seek compensation under the General Agreement on Tariffs and Trade, he says. GATT provides a legal means for nations to respond to tariff hikes with their own round of increases.

But more fundamentally, "we do not think the bill's negotiating lever is appropriate for each one of our trading partners," the official says, adding that what works in Japan won't necessarily work in Europe and vice versa.

With or without executive branch backing, swift action could be forthcoming on the bill. "We expect positive Senate action by at least April," reports Leonard Santos, a committee staff member. A companion bill won't arrive on the House floor this session, but it will be introduced early next year. **-Karen Berney**

COMPUTERS

Data General seeks to raise stakes with full-screen portable computer

Boston—Data General Corp. last week sought to raise the performance stakes for easily transportable personal computers with its own entrant, the Data General/One. Weighing between 9 and 11 lbs, depending on configuration and options, the computer comes not only with a full 25-line-by-80-column liquid-crystal display screen, but has an optional expansion chassis that makes it compatible with the IBM Corp. Personal Computer.

Memory available on the $2,895 machine ranges from 128-K bytes to 512-K bytes. It sports a full keyboard and a built-in rechargeable nickel cadmium battery that can keep it going for more than eight hours. The screen folds into the computer, and the entire unit fits in an attache case.

Running the unit is an 80C88 microprocessor, the complimentary-MOS version of Intel Corp.'s 16-bit chip. "As far as performance, no one feature stands out, but when you put them all together, it's pretty impres-

Executive Privilege In Washington

In America's other Washington, executive privilege is an office with a view—where you'll find your life's work is surrounded by life's rewards.

This quality of work and living is just one of the reasons why companies are choosing to locate new facilities in Washington State.

Developed industrial properties put you close to major urban centers, suppliers, and a wealth of natural resources.

We have an abundance of pure, clear water for production. This same water also provides an abundance of dependable power. And some of the nation's lowest electricity rates.

You'll find excellent transportation systems to domestic markets, as well as the continent's most efficient air and shipping access to the Pacific Rim.

Our large, highly skilled work force is well-educated, motivated, dependable, and supported by a nationally recognized educational system.

Washington's state government understands the needs of business. We offer an attractive industrial revenue bond program. We have no unitary or personal net income tax.

What we do have is a healthy business climate that allows you to operate productively. Profitably. And pleasurably.

You won't just make a better living. You'll make your living better.

To learn more about plant location opportunities in Washington State, call (206) 753-3065. Or write for detailed information:
Washington State Department of Commerce and Economic Development, Dept. EW, 101 General Administration Building,
Olympia, WA 98504.

The State
WASHINGTON ~~D.C.~~

Bring Your Business To America's Other Washington.™

©State of Washington Department of Commerce

Circle 39 on reader service card

sive," notes Stephen Bosley, a market analyst with International Data Corp., Framingham, Mass.

The new machine, unveiled last week, runs Venix, a licensed derivative of AT&T Bell Laboratories' Unix operating system, as well as Microsoft Corp.'s MS-DOS and Digital Research Inc.'s CP/M-86. Basic versions of the Data General portable will be offered with one 3½-in. floppy disk drive; space has been provided for a second drive. Each of the disks has a capacity of 712-K bytes.

IBM compatibility. The Westboro, Mass., firm is also offering an optional expansion chassis that can be configured with a 5¼-in. IBM-compatible floppy disk drive, thus allowing the machine to use software written for the IBM PC. The expansion chassis will accept up to five full-size expansion cards. A 300-baud internal modem is standard, with an external 1,200-baud modem available as an option.

Of particular interest is the full-size screen. Two 4,000-gate arrays provide all LCD functions. The firm says the screen "paints" graphics as quickly as an IBM PC. The display is bit-mapped with 640 by 256 pixels and measures 12 in. diagonally.

"But we think that the development of [the portable computer] market will depend on screens that you don't have to twist this way and that [to read]," Bosley points out. Indeed, although the screen is covered with an antiglare coating, reporters at the news conference held to introduce the product found it difficult, if not impossible, to read the screen unless they were right in front of it.

Data General believed that the only type of product missing from its Desktop Generation product line was an IBM-compatible personal computer, according to Donald McDougall, vice president and general manager of the company's Technical Products Division. But further consideration resulted in a broader strategy.

"If we're going to have to [offer] a product that's absolutely PC-compatible, let's figure out what else it needs," McDougall explains. "If it's simply another desktop that's absolutely PC-compatible, that's not very good." The firm thought that what was needed was "something that's in the forefront of what people really want to do, which is something that's absolutely PC-compatible and absolutely portable."

More than a solution. McDougall says that when Data General looked at the technical marketplace it plans to address with the new portable, the need for a tool rather than a solution became obvious. "You don't typically provide [the engineer with] a solution, you typically provide him with a tool, because [the engineer] generates a solution. That's his job," says McDougall. For this reason, he says, the DG/One will be offered with basic programming tools, including Unix and Lisp derivatives, and with syntax editors for Ada, C, and Pascal.

The machine was developed jointly by teams from Data General in North Carolina and Massachusetts, as well as from its Japanese subsidiary, Nippon Data General. The product will be made in Japan. The firm says basic units will be available in 30 days.

-Craig D. Rose

News briefs

AT&T develops ultratransparent fiber

Researchers at AT&T Bell Laboratories, Holmdel, N.J., have claimed two world records for information transmission using experimental low-loss fiber-optic and laser light sources. Ultratransparency of the single-mode fiber was accomplished using a minimal amount of dopants in the 8.7-μm core, but light guidance was achieved with a relatively thick fluorine-doped glass cladding. The fiber was fabricated using the modified chemical vapor deposition process developed at Holmdel. In one experiment, an unboosted signal at a rate of 420 million pulses/s traveled over a record distance of 204 km. In the second experiment, an unboosted 2-billion-pulse/s signal traveled 130 km.

Smart card gets workout in Norway

An electronic-payment experiment to begin this week in Norway should give a shot in the arm to efforts by Bull of Paris to gain broader international acceptance for its CP8 microprocessor-based memory card. To be carried out in the city of Lilleström, just north of Oslo, the experiment initially will involve 40 payment terminals in shops, 10 terminals in banks for loading and validating cards, 10 card-query terminals with which users could consult the data stored in their cards, and 24 card-payment telephone booths. In 1985, the experiment will be expanded to include remote payment using home terminals. By early next year, some 7,500 cards equipped with both magnetic strips and one-chip 6805-based microcomputers are expected to have been distributed to participants. The chip is produced for Bull by Motorola Inc. at the U.S. company's plant in East Kilbride, Scotland.

Rovsing sell-off salvages brain, not brawn

Danish industrial circles are hopeful that the high-technology engineering core of Christian Rovsing A/S, Denmark's leading high-tech communications and electronics firm—which filed for voluntary liquidation last month—can be kept from going down the drain. Court-appointed liquidators have sold off the company's manufacturing activities and say they have hopes of being able to attract new capital to continue its systems engineering activity, which is currently involved in communications systems for the North Atlantic Treaty Organization, American Airlines, and Air Canada. Growing pains and the need to finance expansion through bank loans wiped out the company's capital and left it with about $30 million in unpaid debts.

AI looms small in the marketplace

The artificial intelligence market in the U.S. will rack up an annual compound growth rate of 67% for the next five years—from $155.3 million in sales this year, to $2 billion in 1989, according to FIND/SVP, a New York market research firm. And although AI is expected to produce dramatic changes in society, the company projects sales of AI products to be only a fraction of the total electronics marketplace, estimated at $350 billion by *ElectronicsWeek.*

A McGraw-Hill Electronics Publication

INDUSTRIAL ELECTRONICS EQUIPMENT DESIGN

This new bi-monthly magazine offers advertisers a unique way to target their messages to 25,000 electronic design engineers concerned specifically with the design and manufacture of industrial electronics equipment.

It will be devoted entirely to international coverage of this important segment of the electronics industry. It will be produced by its own experienced team of technical editors. They are dedicated to providing readers with the most technically complete and accurate information available. Typical contents of each issue are as follows:

Representative table of contents.

News and trends.

CAD: New work-station software generates test patterns
Components: Voice recognition boards reach market
Control: IBM and GE team up in process-control thrust
Careers: Industry supporting master's programs in manufacturing

Industry briefs, people and plants.

Eaton's Jim Bowen; Hitachi's move to CAD

Technical Articles.

Cabling techniques in industrial control systems, by Joseph Cable and Sam Control, ITT Industrial Systems.

How to set up quality engineering database with LISP, by P.K. Wrigley, Lisp Systems, Inc.

Designing programmable motor controls with a microprocessor, by V.K. Krishna, Calcutta Electronics.

Flexible programming language simplifies robot control, by T.M. Larson and A. Coppola, Unimation, Inc.

Design notes: Timer-Converter generates ramp for chart recorders; Industrial ammeter measures 10-A peaks; Wideband radiation monitor

New products.

Test and measurement equipment
Components
Production equipment
Control equipment
CAD/CAM
Materials
Services
New Literature

Departments.

Editorial
Letters
Meetings
New Books

Special 1984 introductory rates.

Ad size.	ElectronicsWeek advertisers.	Non Electronics-Week advertisers.
1 page:	$1,000	$1,500
2/3 page:	750	1,125
1/2 page:	620	930
1/3 page:	400	600
1/4 page:	320	480
1/6 page:	220	330

Cover rates.

4th cover:	$2,160	$2,635
3rd cover:	1,710	2,260
2nd cover:	1,810	2,410

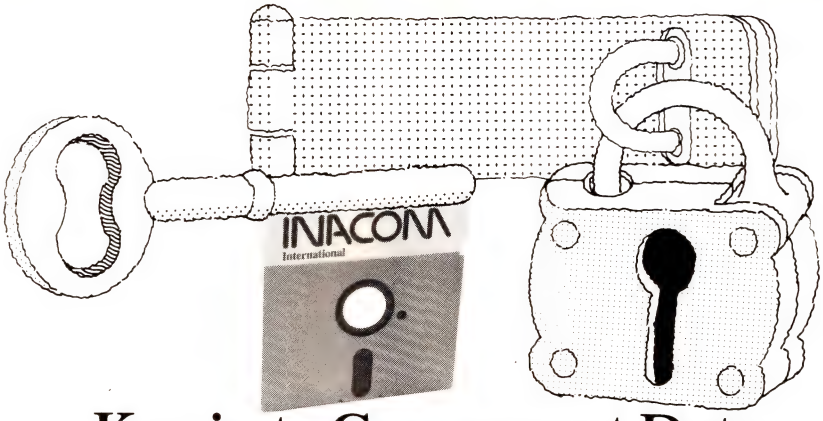
Color charges:

Two color, standard:	$305
Matched 2nd color:	510
4 color process:	610
4 color process spread:	950

1984 Issue dates.	1984 Closing dates.
November 15, 1984	October 15, 1984

For space reservations, call Production Dept.,
McGraw-Hill Electronics Publications, (212) 512-3140,
1221 Avenue of the Americas
New York, NY 10020

Circulation: 25,000 industrial electronics equipment design engineers worldwide.



Key in to Component Data

Locked somewhere inside your information system is the exact component, material, or specification you are searching for. Unfortunately, you don't always have the key.

The key that unlocks your information system is now available from **INACOM International: TECH-DOC/MICRO-INDEX,** Computer Aided Access to component data, *the* system for today's engineering workstation.

With **TECH-DOC/MICRO-INDEX** you can search for the specific data you need sensibly, reliably, and fast at your own workstation. Thanks to multiple cross-referencing by part/component description, IC part number, specification number, FSC, and supplier, you're in and out of your information system like Houdini.

Available for mainframe, mini, or micro computers, **TECH-DOC/MICRO-INDEX** is regularly updated automatically, relieving you of tedious, time-consuming effort and resulting in increased productivity.

TECH-DOC
MICRO-INDEX,™
the CAE workstation
component data system
from INACOM.
1-800-443-INFO

Circle 42 on reader service card

Circuits. Circuits. Circuits!

Electronic Circuits Notebook.

344 pp., illus.

Some 268 proved-in-action circuits are gathered here for the first time in a single, easy-access resource that meets the highest standards of performance, cost reduction, and reliability. From amplifiers to voltage regulators...from data conversion to phase lock loops...you'll find the most needed, most reliable solutions to a vast range of circuitry challenges.

Circuits for Electronics Engineers.

396 pp., illus.

More than 340 circuits from all over the world are arranged here by 51 of the most important functions designers use to implement their systems, including amplfiers, detectors, memory circuits, integrators, and much more. Complete with component values, circuit diagrams, waveshapes where applicable, and clear explanations of operations and applications.

Design Techniques for Electronics Engineers.

370 pp., illus.

The best of *Electronics'* popular "Engineer's Notebook," this is an indispensable storehouse of solutions to numerous frequently encountered design problems. You'll find a host of proven techniques to help you make measurements, interpret data, make calculations, choose materials, control environment, lay out and purchase components, and more!

Don't forget the other valuable Electronics Magazine Books on the coupon below.

Electronics Week Books
P.O. Box 541
Hightstown, N.J. 08520
(Tel.) 609/426-5070

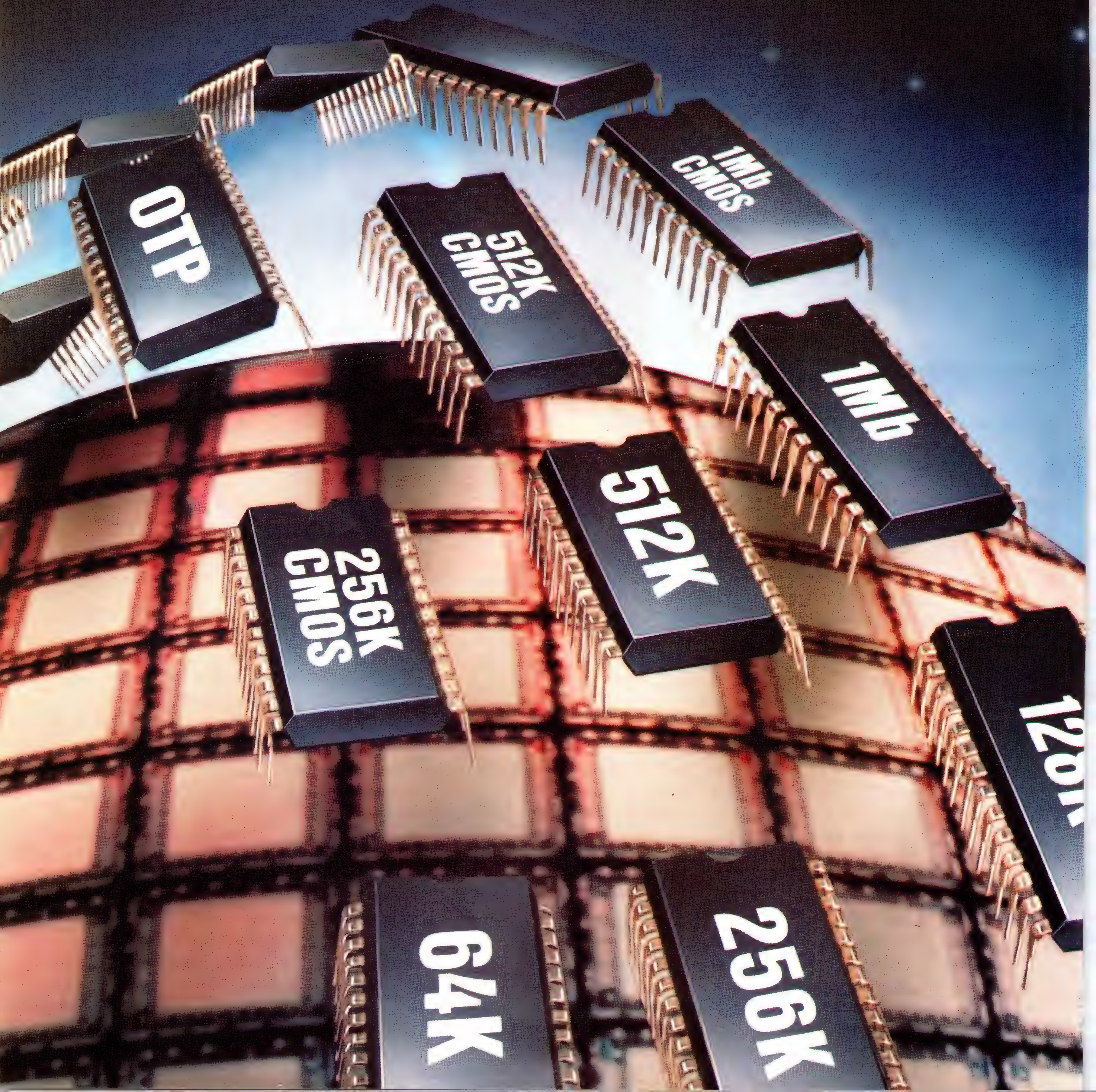
No. of Copies	Title	Price
______	Electronic Circuits Notebook	$17.95
______	Circuits for Electronics Engineers	$17.95
______	Design Techniques for Electronics Engineers	$17.95
______	Microprocessors and Microcomputers: One-chip Controllers to High-end Systems	$18.95
______	Microelectronics Interconnection and Packaging	$15.95

If after my 10-day free-trial examination I am not fully satisfied I understand that my payment will be refunded. Payment must accompany orders under $25.

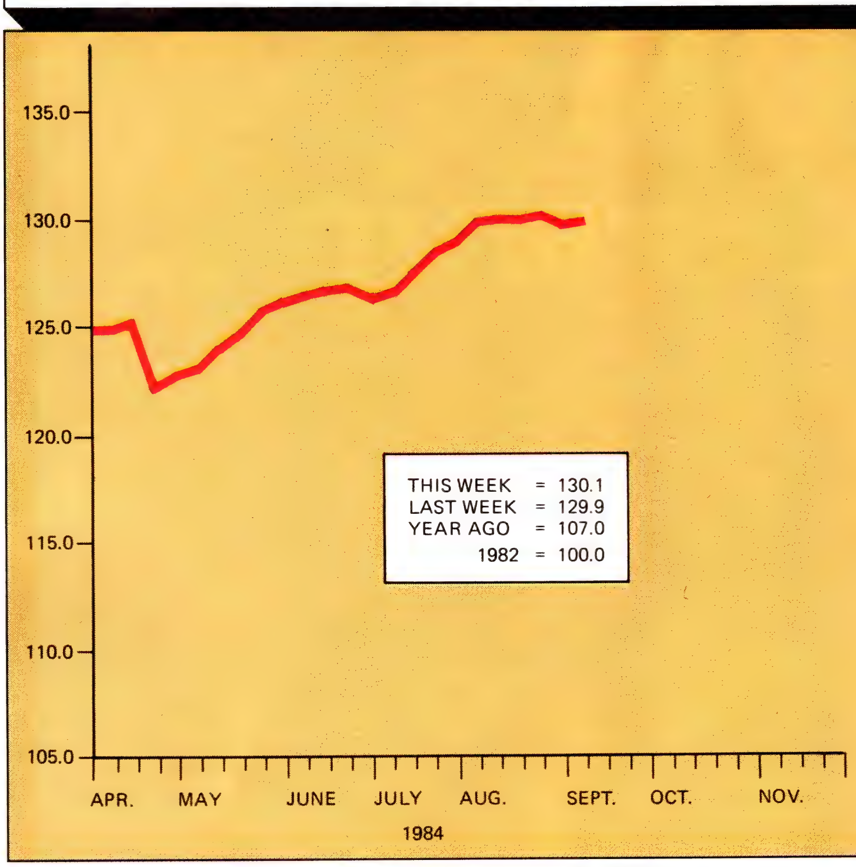
Discounts of 10% on orders of more than 10 books.

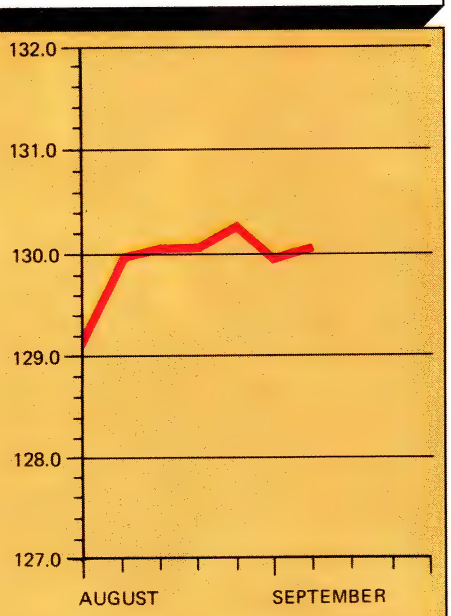
☐ Payment enclosed ☐ Bill firm ☐ Bill me
Charge to my credit card:
☐ American Express ☐ Diners Club ☐ Visa ☐ Master Card*
Acct. No. Date Exp.
*On Master Card only, first numbers above name
Name Title
Company
Street
City State Zip
Signature ELH

ROM Leadership...



ElectronicsWeek Index





The *ElectronicsWeek* Index, a seasonally adjusted measure of the U.S. electronics industry's health, is a weighted average of various indicators. Different indicators will appear below from week to week.

U.S. ELECTRONICS ECONOMIC INDICATORS

	July 1984	June 1984	July 1983
Production workers (thousands) Office and computing machines	206.3	205.0	192.4
Communications equipment	286.3	282.0	262.5
Radio and TV receiving equipment	64.0	63.6	55.7
Components	421.8	421.2	344.7

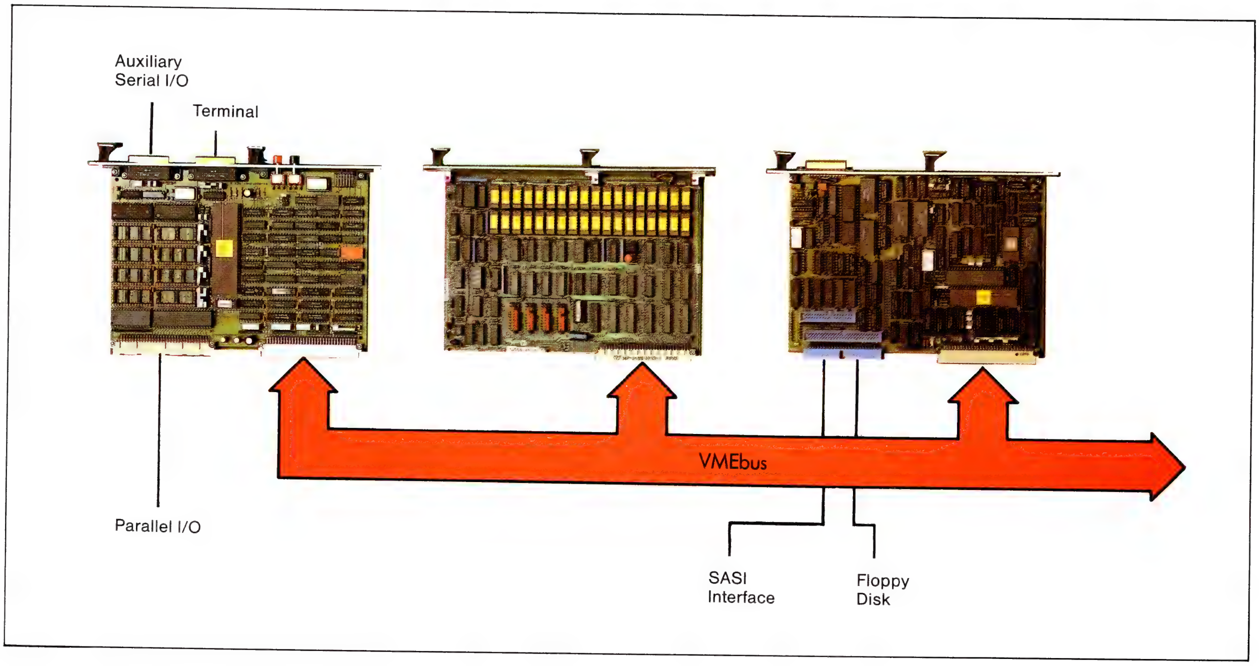
Paced by employment gains in the electronics industry, the *ElectronicsWeek* Index turned upward in the latest week. The largest rise in employment was recorded by makers of communications equipment. The Index was also pushed up by strong automobile production during early September. Auto makers' inventories remain low, though, as fleet purchasers wanting quick delivery in case of an auto workers' strike are snapping up every car they can.

In spite of strong credit demand, it appears that interest rates should stabilize or even fall a bit until the presidential election. However, considering the private sector's tremendous appetite for financing, combined with the continuing need to fund the federal budget deficit, it seems clear that the Federal Reserve Board will be forced to tighten the reins on credit once the election is over, causing rates to rise. Higher rates will at first affect the housing and auto industries, and then spread to the capital goods sector as the year ends.

At this point, it still seems unlikely that this slowdown will turn into a recession. In 1985, the economy should grow 2.7% in the first quarter, then slow to a growth rate of less than 1% in the second quarter, according to the McGraw-Hill forecasting subsidiary, Data Resources Inc., Cambridge, Mass. (The economy grew 10.1% in this year's first quarter.)

The latest quarterly survey by the Commerce Department concludes that capital spending by U.S. firms should rise 14.3% this year, pretty much in line with previous estimates. However, the survey found that in manufacturing, the increase will be 16.9% compared with the last estimate of 15.5%. Moreover, major end markets for electronics will post large spending gains this year: electrical machinery, up 26%; and motor vehicles, up 49%.

MVME315KIT with VERSAdos!



The MVME315KIT is the best way to get started with VME. It provides all the basic functions at a very attractive price. Along with the three boards, you get a ready-configured VERSAdos software package that gives you Realtime Operation, a full set of development tools and multi-user expansion if you need it. With this kit you can start developing application programs on your VME target hardware!

1. MVME101 MC68000 Monoboard Microcomputer
- 8 MHz MC68000
- 2 serial, 2 parallel ports
- 8 x 28-pin RAM/ROM sockets (256 Kbytes EPROM)
- 7-segment status display
- Triple programmable timer

2. MVME201 Module
- 256 Kbytes dynamic RAM
- Byte parity check
- On board refresh
- Four independent memory blocks

3. MVME315 Intelligent Disk Controller
- Intelligent floppy disk controller/SASI interface
- MC68121 processor
- Controls up to four 8" or 5 1/4" floppy disk drives
- Provides intelligent interface to SASI/SCSI bus
- Peripheral and system DMA
- Up to 32 Kbytes of dual-ported buffer memory

4. MVME101BUG VMEbug ROM SET
- Debugging monitor
- 32 Kbyte EPROM
- Permits full speed execution
- 30 debug commands
- Line assembly/disassembly
- Host computer communication support
- Loader for disk OS

5. M68KVDOS VERSAdos 4.3 on 8" Floppy Disk
- Realtime, multi-tasking
- Modular, layered design
- Hard or floppy disk-oriented
- Multi-user session management
- ROMable kernel (RMS68K)
- Pre-configured version
- Drivers for VME I/O modules included
- Includes assembler, linker, text editor, utilities

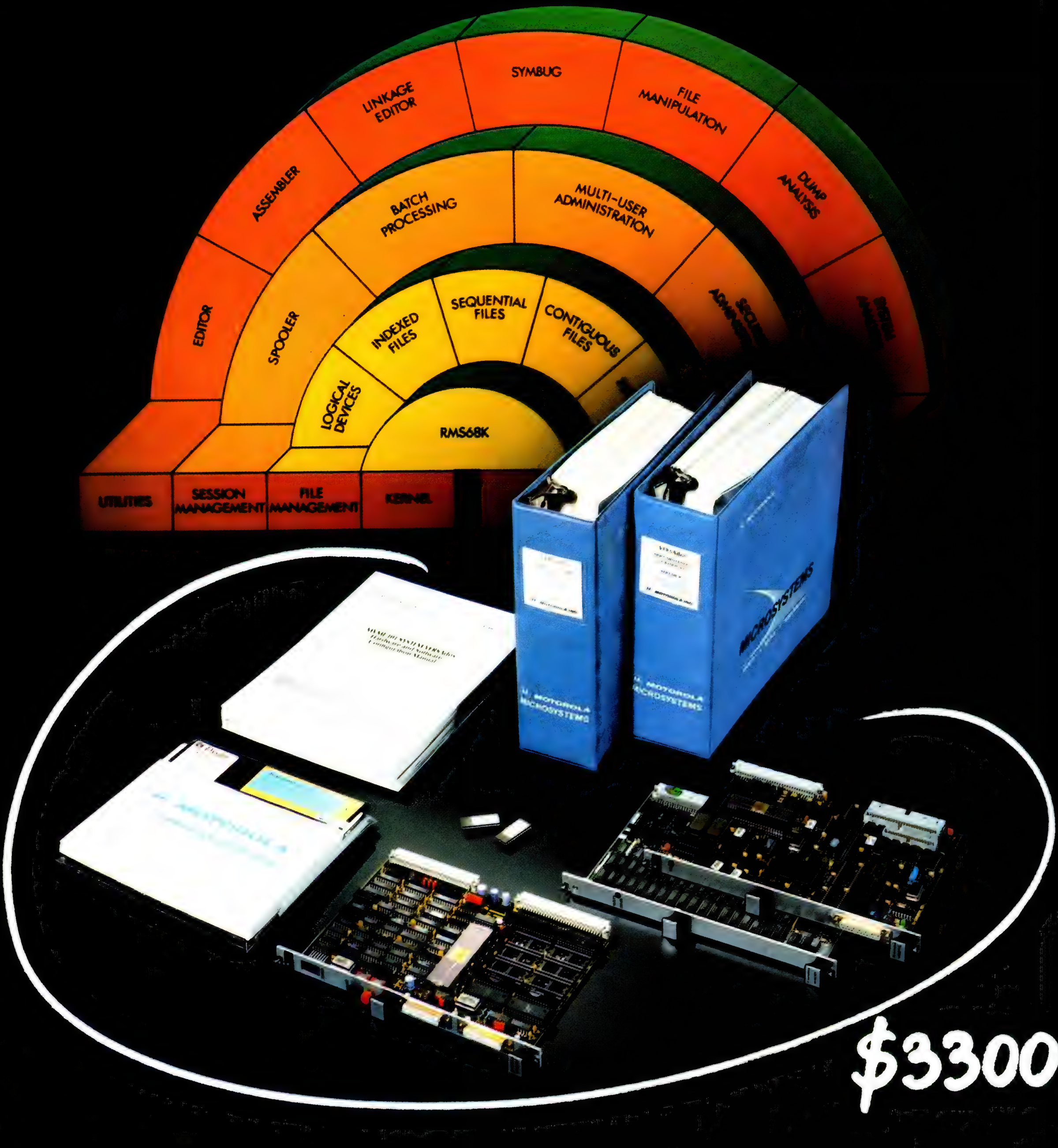
SASI is a trademark of Shugart Associates
VERSAdos and VMEbug are trademarks of Motorola Inc.

MOTOROLA
Semiconductor Products Sector

European Distributors: Austria (2 22) 88 56 11/**Belgium** (02) 2 16 21 00/**Denmark** (01) 69 05 11/**Finland** (80) 6 92 25 77/**France:** Alfatronic (1) 7 91 44 44 · Feutrier (77) 74 67 33 · FIF (1) 7 72 46 46 · SCAIB (1) 6 87 23 13 · SCT (61) 22 04 22/**Germany:** Distron (0 30) 3 42 10 41 · EBV (0 89) 61 10 51 · Elkose (0 71 41) 48 71 · Prosystem (0 61 07) 7 50 30/**Greece** (1) 3 61 43 00/**Italy** (2) 6 12 00 41/**Netherlands** (0 41) 39 29 01/**Norway** (02) 26 99 55/**Spain** (1) 7 54 30 01/**South Africa:** ASD (0 11) 8 02 58 20/**Sweden** (08) 93 00 00/**Switzerland:** Elbatex (56) 27 01 27 · Omni Ray (1) 8 35 21 11/**Turkey** 64 65 00/**United Kingdom:** Crellon (0 62 86) 44 34 · Hawke (01) 9 79 77 99 · STC (07 29) 2 67 77 · Thame (0 84) 4 21 45 61/**Motorola Offices: Asia and Pacific Region:** Hong Kong (0) 22 31 11 · Tokyo (3) 4 40 33 11

Starting with VMEbus?

Ask for the Motorola start-up kit.



$3300,-*

* Price valid in Europe only until 30 Nov 84

electronica 84

Nov 13-17 Stand 18-D 70

MOTOROLA

Circle 271 on reader service card

Because we deliver what our customers need to compete. Worldwide!

The density of your choice

High speed ROMs in all densities, including NMOS EPROM replacements, and standard COBs for all computers on the market. And CMOS ROMs are on the way!

The quality you specify

Specify quality levels of 250 PPM today. Expect 100 PPM tomorrow. We design quality and testability in — for inherent reliability.

The quantity you need

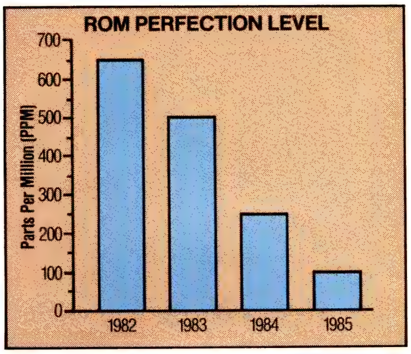
No order is too large. Our minimum order is 2500. It's common for General Instrument to fill million-piece orders.

The delivery you want

Fast turnaround is assured with LAMP,™ late mask programming, large wafer banks and production facilities on three continents.

Design flexibility you expect

Our ROM family, fully adaptable to firmware, offers the expansion capabilities you need for present and future product designs. Examples: VariPage™ programmed paging options; FlexSelect™ programmable options for Chip-Select requirements; custom COB design capabilities, complete turnkey cartridge services, and many other options.



ROM PRODUCT PORTFOLIO

PART NUMBER	DESCRIPTION	PIN SIZE	ACCESS TIME (ns)	EPROM COMPAT	ADDED FEATURES
R0-3-9316B/C	2K x 8	24	450,350	2716	
R094132B/CS/C	4K x 8		450,350,300	2532	
R09432B/CS/C/DS/D	4K x 8		450,350,300, 250,200	2532	
R09433B/CS/C/DS/D	4K x 8			2732	
R09464B/CS/C/DS	8K x 8		450,350,300, 250	68764	
R09864B/CS/C/DS/D	8K x 8	28	450,350,300, 250,200	2764	
R09128B/CS/C/DS/D*	16K x 8		450,350,300, 250,200*	27128	FlexSelect™
R09256B/CS/C/DS/D*	32K x 8			27256	
*R09512	64K x 8		< 300	JEDEC	VariPage™
*R091000	128K x 8				
*R0C128B/CS/C/DS/D	16K x 8		450,350,300, 250,200	27128	CMOS FlexSelect™
*R0C256B/CS/C/DS/D	32K x 8			27256	
*R0C512B/CS/C/DS/D	64K x 8			JEDEC	CMOS, FlexSelect™ with VariPage™
*R0C1000B/CS/C/DS/D	128K x 8				
SPECIALTY ROMs					
R094P64	8K x 8 2 x 32K Banks	24	450	2532	Page ROM
R094P128	16K x 8 4 x 32K Banks				
R09540	4K x 10	28	N/A	N/A	On chip address latch
R09580	8K x 10				
R09120	12K x 10				

*For Future Release

CHIP ON BOARD (COB) PRODUCT PORTFOLIO

PART NUMBER	DESCRIPTION		ACCESS TIME (ns)	ADDED FEATURES
COB59764	64K COB	for Atari VCS	450	Page ROM/Std Part
COB607128	128K COB	for Colecovision		General Instrument Std Board Design
COB60964	64K COB	for VIC-20		
COB609128	128K COB			
COB61064	64K COB	for Atari Computers	350,300	
COB610128	128K COB			
COB62564	64K COB	for Radio Shack Color Computer		
COB625128	128K COB			
COB63464	64K COB	for C-64		
COB634128	128K COB			
COB63964	64K COB	for MSX		
COB639128	128K COB			
COB63664	64K COB	for IBM PC Jr.	250	
COB636128	128K COB			

For the density, quality, quantity, delivery, and flexibility you need, call the nearest Microelectronics Division Sales Office — and we'll deliver our ROM Leadership for you.

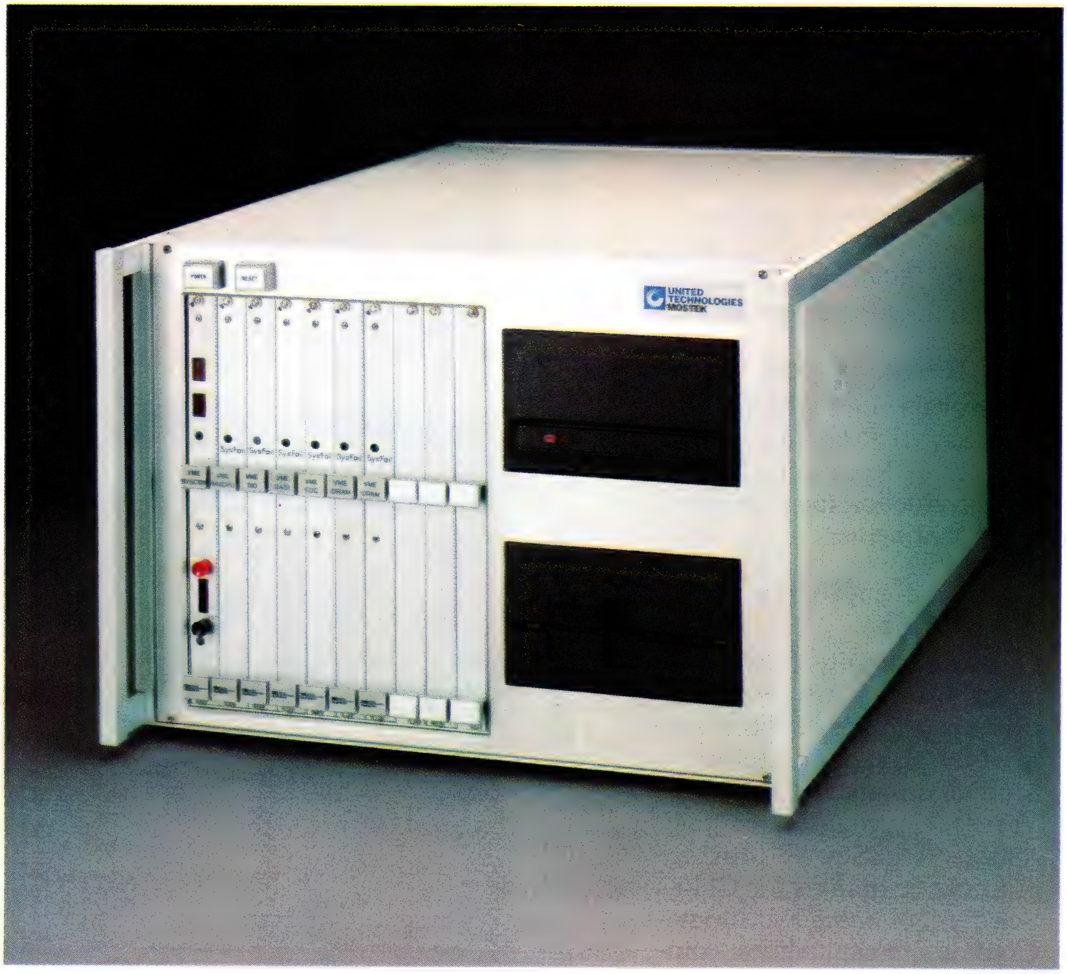
We help you compete®

GENERAL INSTRUMENT

Sales Offices USA: CA, 213-322-7745 or 408-496-0844; **GA,** 404-476-0274; **IL,** 312-981-0040; **IN,** 317-841-9328 or 219-291-0585; **MA,** 617-938-5890/91; **MD,** 301-269-6250; **MN,** 612-894-1840; **NC,** 919-828-0317; **NJ,** 201-254-5024; **NY,** 516-933-3379; **TX,** 214-934-1654; **EUROPE: London,** Ruislip, (8956), 36141; **Milano,** (2) 5062648; **Muenchen,** (89) 956001; **Paris,** (1) 374-1133; **Stockholm,** (8) 679925; **ASIA: Hong Kong,** (5) 434360; **Osaka,** (06) 323-1877; **Seoul,** (2) 744-8543; **Singapore,** (65) 235-8030; **Taipei,** (2) 914-6234; **Tokyo,** (3) 437-0281

Circle 45 on reader service card

VMEbus + UN


POWER
RESET
UNITED TECHNOLOGIES MOSTEK
SysFai
VME SYSCON
VME DRAM

IX™+MOSTEK

Add the above together, and what do you get? The Mostek Matrix 68K™. It combines a multi-user, 16-bit microcomputer system based on the VMEbus architecture – plus a UNIX operating system. The result is a powerful and cost-effective tool for system integrators.

The Matrix 68K is also a high performance tool. It's modular. Structured. Flexible. And easily expandable for future application requirements. What's more, it can lower your development costs, and get your product to the market faster.

This new system in its base configuration features 640KB of expandable main memory, a 36MB Winchester disk, 1MB of floppy disk storage, serial RS-232 interfaces for five users, a standard parallel printer interface, and three open slots for expansion.

The heart of the system is the VME-MMCPU board with its 16-bit processor. The VMEbus-based modular board designs meet today's 16-bit needs. And permit fast, easy reconfiguration for 32-bit applications in the future. So, you won't have to develop another architecture as more powerful hardware becomes available.

The flexibility of VMEbus architecture is further enhanced by the powerful UniPlus+™ operating system (UNIX System III with Berkley enhancements). It provides you with a flexible, expandable operating system that's well suited to program development, text preparation, and general purpose processing. Its supported languages include "C," Fortran, and Pascal.

Another big plus is Mostek's ongoing development of new cards for the VMEbus: a one megabyte DRAM, SMD disk controller, and Intelligent I/O boards will soon be available. With the reconfiguration software package, UNIX can easily be expanded to use these and many more VMEbus boards.

With the Matrix 68K, you get high performance. Full VMEbus compatibility. Transportable software. Flexibility. And unusual value. Because it's all you need today. And tomorrow.

Get in on VMEbus + UNIX + all the future applications. Contact Mostek, 1215 W. Crosby Road, MS2205, Carrollton, Texas 75006, (214) 466-8801. In Europe, (32) 02/762.18.80. In Japan, 03/496-4221. In the Far East (Hong Kong), 5-681157.

UNIX is a trademark of Bell Laboratories. UniPlus+ is a trademark of UniSoft Systems. UniPlus+ is derived from UNIX System II under license from AT&T. Matrix 68K is a registered trademark of Mostek Corp.

UNITED
TECHNOLOGIES
MOSTEK

CONVENTION MANAGER ANGWIN TO GET A NEW SHOW ON THE ROAD

Los Angeles

Some fresh ideas are circulating through Electronic Conventions Management Inc., the nonprofit firm that stages Wescon and Electro, as well as several other of its member professional industry organizations' longest-running shows. These notions can be sourced to Bruce S. Angwin, who is capping a 32-year career in the field with his new role of general manager of the organization.

Angwin's background in the industrial show business started with the first Wescon in 1952, when he served on the original board of directors. Since then, he has filled many show posts as well as industry positions.

As Angwin explains the changes in the offing, they are not departures, but rather "a redefining of what the shows are all about." Topping his list of objectives is rooting out the obsession with racking up the highest possible attendance for shows—a fixation that is not confined to Electronic Conventions Management.

"Under former management, more was better," says Angwin. "But that's not the way to go. That's the 'head-count' myth. If it were true, all we have to do is open the door and sweep the street."

His conclusions on this matter stem from a realistic appraisal of the shrinking resources that increasingly influence industry shows. "We've reached our physical limits," he explains. Hotel rooms, transportation, restaurants, and the facilities to accommodate the large crowds that attend Wescon—which alternates between San Francisco and Anaheim, Calif.—and Electro, alternating between Boston and New York, are simply insufficient.

Holding down attendance will involve being more selective about who is allowed in the shows, and probably will not take place all at once. But the effect will be to provide higher quality prospects for exhibitors by eliminating those with little solid reason to be there, he says.

Show man. Bruce S. Angwin, reacting to changes in the industry, says he will redefine what electronics shows are all about.

This dovetails with another of Angwin's ambitions: helping exhibitors to get their money's worth from the trade shows, which are a very expensive proposition for a company. Depending on the location, footing the bills for a four-day event can run into the tens of thousands of dollars, not including show fees.

Contrary to what many companies believe, "trade shows are not the best way to reach customers. They are not three-dimensional advertising, or a corporate identification program," says Angwin. He proposes to aid exhibitors through ECM seminars, which will teach both fundamentals and sophisticated ways to take advantage of shows.

Another topic that raises questions is the role of the ECM regional shows that are spotted between the majors. Currently, these are Midcon, Southcon, and Northcon. Skeptics believe these detract from the bigger events, but Angwin is a stout supporter. "Eighty percent of attendees come from a 500-mile radius, which makes them successful for us." Not only will ECM keep improving the present shows but it is considering adding others, at unnamed sites.

Finally, ECM is testing the waters with a computer-only show by slotting its Mini/Micro event in Anaheim in February. It was previously tied to Electro and Wescon.

Angwin is careful to point out a basic difference between Mini/Micro and the other two computer shows—National Computer Conference and Comdex. "They are aimed at the ultimate consumer. We serve the industrial electronics firm and manufacturer."

-Larry Waller

Deubert leads ITT Semiconductor push into consumer signal processors

Freiburg, West Germany

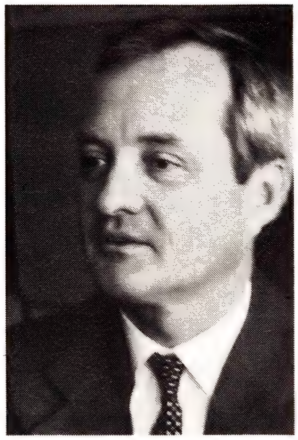
If the ITT Semiconductors Group realizes its goal to become a major player in the arena of digital signal processors, it will be in large part due to the efforts of Rolf Deubert, project manager and head of concept engineering at Intermetall GmbH, the group's main production facility.

Although the ITT group entered the field only last year, it hopes that in 1984 shipments of the new chips will account for roughly 5% of its total sales of $250 million expected for this year. The 1985 target is a 15% share of the total.

An essential element in Deubert's strategy for tackling the signal-processor market is concentrating on consumer-oriented chips. While most of the other contenders in the field—among them IBM, Texas Instruments, and TRW—are going after industrial applications, "we are aiming at the audio, video, and automotive sectors. These make for big volume and hence low prices," says the 48-year-old executive.

A new concept at the ITT Semiconductors Group, Deubert's 16-person engineering team has a somewhat unconventional function. "We are the link between the customers and our in-house development group, and we are concerned primarily with setting target specifications." At many other companies, the developer is the direct link to the customer, and it is he who often makes product decisions, he notes.

Deubert brings to his job the right combination of experience coupled with leadership abilities. The holder of a master's degree in electrical engineering from the Technical University of Stuttgart, he joined ITT in 1962, first working as a television designer at the ITT subsidiary Standard Elektrik Lorenz AG. Four years later, he became head of SEL's TV applications lab. In 1970, Deubert moved over to the ITT Semiconductors Group, where he has held various management positions.


Goes for quantity. Rolf Deubert is aiming ITT's digital signal processors at the audio, video, and automotive sectors.

"For all our activities in consumer devices, we are not letting industrial applications slide," says Deubert. Toward that end, the group is developing an industrial version of its recently introduced complementary-MOS universal digital processor chip, the UDP-I. It is optimized for use in communication systems for echo suppression, in vocoders, and for handling modem and dual-tone multifrequency functions. **-John Gosch**

Beilman advancing the cause of microelectronics in North Carolina

Donald S. Beilman was about to close the door on 29 years of service with the General Electric Co. But during his final days as vice president and general manager of GE's advanced microelectronics operations, he ran into James Hunt, the activist governor of North Carolina.

Beilman was heading a team charged with selecting a site for GE's new $55 million microelectronics research and development facility. "Everything about North Carolina's Research Triangle Park was very inviting, except for the distinct absence of an ongoing R&D effort in silicon," he recalls. To rectify that problem, the governor announced in 1980 the state's intention to build the $43 million Microelectronics Center of North Carolina.

Two years later, GE was calling the state home and Beilman had accepted the governor's offer to become the center's first president. "It was an unexpected opportunity, exactly what I was seeking after retirement. I had been with private industry for nearly 30 years, and here was a chance to do something totally different."

Explaining what the difference is, Beilman notes that MCNC addresses what has been a substantial weakness in U.S. technological development. "Traditionally, company research laboratories have focused efforts internally. But as everyone was trying to do the same thing, progress has been slow. MCNC offers industry a unique strategy to overcome that fragmented approach by bringing universities and industries together in way which will shorten the time gap from discovery to commercial application." The aim to shave off at least five years.

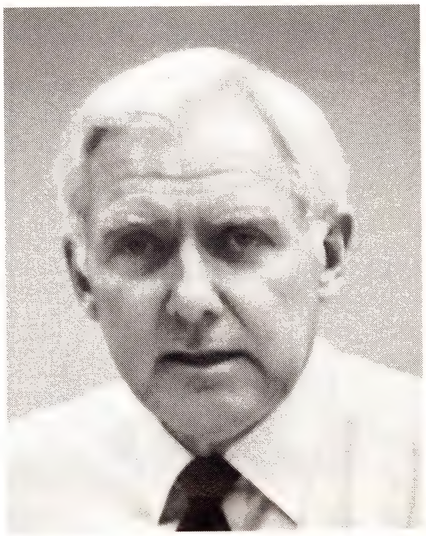
Staffed by more than 200 university faculty, graduate students, and industry researchers, and supported by a 10,000-ft.^{2} class 10 (10 foreign particles per cubic foot of air) clean room, MCNC's goal is to develop submicrometer fabrication processes by the end of the present decade.

As envisioned by the governor, MCNC was to be state's magnet for attracting electronics companies to Research Triangle Park [*ElectronicsWeek*, Sept. 10, p. 38]. "Part of my job involves traveling with the governor and telling the MCNC-RTP story to firms on the verge of expansion," says Beilman. MCNC has already drawn enough investment to more than offset the state's expenditure on it. Moreover, the newcomers cover the whole spectrum of high-tech business.

But ultimately, "the greatest contribution I can make to North Carolina is to make MCNC known as the place to go for state of the art technology." And he has a wealth of experience to draw on. At GE, the 55-year-old Cornell University graduate with a bachelor's degree in electrical engineering started out designing over-the-horizon radars and rose to manager of strategic defense systems.

After 20 years of military engineering, Beilman wanted to try something new and went to the civilian side of GE's operation. As vice president and general manager for major appliances, he revitalized the department's engineering functions by introducing computer-aided design systems and microelectronics technology.

In a tour of MCNC's facility, Beilman takes time to mention a new GE refrigerator in the employees' lounge. "See that touch-control, microprocessor-driven machine? Along with dishwashers, ovens, and other GE appliances, I designed them," he proudly states. **-Karen Berney**


Tarheel booster. Donald S. Beilman wants MCNC to be known as the place to go for state-of-the-art technology.

Enter the new era of MICROSYSTEM DESIGN

MICROPROCESSOR SYSTEMS: Software and Hardware Architecture delivers a wealth of information about microcomputers, peripherals, networks, signal processing and software, that leads the field in the 80's!

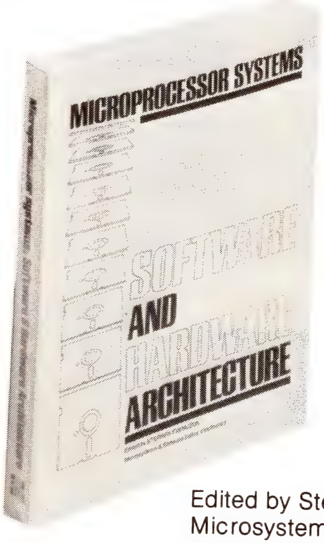
This book is a comprehensive collection of technical articles, carefully detailed and presented, in exclusive reprints from *Electronics* Magazine.

Corporate Managers, Project Managers, Design Engineers, Market Managers: **MICROPROCESSOR SYSTEMS: Software and Hardware Architecture** is one book for all!

Six knowledgeable chapters examine:

- Significant trends in the development of new software systems and applications
- Technical articles on the manufacture of new microprocessors
- Approaches to memory management used by major chip manufacturers
- Conveniences of peripheral chips
- Alternative network methods from Ethernet to token-passing protocols
- Modular procedures for making digital signal processing systems

Engineers -- Save precious time by eliminating a cumbersome series of software instructions.



Edited by Stephen Evanczuk,
Microsystems & Software
Editor, *ELECTRONICS*

Directed chiefly at design tactics, **MICROPROCESSOR SYSTEMS: Software and Hardware Architecture** helps you avoid errors and overcome all your architectural problems.

- Brings you the needed simplicity of design, without sacrificing performance of the finished system
- Offers a means of tapping microsystems into the power of mainframe machines
- Recounts major breakthrough in dedicated chips that handle math operations in record time

In one resourceful volume, **MICROPROCESSOR SYSTEMS: Software and Hardware Architecture** lets you understand:

- Functions of hour end microprocessors and controllers
- Key microprocessors that trigger the personal computer revolution
- The importance of dedicated chips more sophisticated than mainframes of yesteryear
- Significant aspects of microcomputer software
- Efficiency of peripheral-control chips

Here it is --
MICROPROCESSOR SYSTEMS: Software and Hardware Architecture - Let it design for you!

Don't be left in the dark: **MICROPROCESSOR SYSTEMS: Software and Hardware Architecture** illuminates the design process of an ever changing industry.

Don't delay -- order your copy today!

Use the coupon or send in your company purchase order.

MC GRAW-HILL PUBLICATIONS CO.
Attn: ECC
McGraw-Hill House
Maidenhead, Berkshire SL6 2QL
England
(Tel. (0628) 23431; Telex 848640)

Send me ________copy(ies) of MICROPROCESSOR SYSTEMS: Software and Hardware Architecture for $21.95 each. (U.S. residents please include local sales tax).

☐ Payment enclosed (postage & handling included)
☐ Bill me (postage, handling & tax will be added) NOTE: All orders under $30 will be sent a pro forma invoice requiring prepayment.
☐ Bill my company. Purchase order is attached.

Ship to:

Name ______________________________

Company ______________________________

Street Address ______________________________

City____________State__________Zip__________

Country ______________________________

McGraw-Hill knows you will be satisfied, but if for some reason you are not, there is a ten-day money-back guarantee that applies on all books.
Allow four to six weeks for delivery.

SIEMENS

Programmable timer SAB 0529:

the digital time machine

With the programmable digital timer SAB 0529 from Siemens you can realize very exact delay times between 1 second and 31.5 hours. Power supply as well as timebase is the 50 Hz line. The device can drive triacs or relays directly, has eight overlapping timing ranges and two modes of operation "momentary switching and switch-off delay".

Timing range	A	B	C	Basic timing unit	Max. time (50 Hz)
1	L	L	L	1 s	63 s
2	L	L	H	3 s	189 s
3	L	H	L	10 s	630 s
4	L	H	H	30 s	1890 s
5	H	L	L	1 min	63 min
6	H	L	H	3 min	189 min
7	H	H	L	10 min	630 min
8	H	H	H	30 min	1890 min

The SAB 0529 is therefore the suitable timer wherever you need long and accurate delays in switching operation:

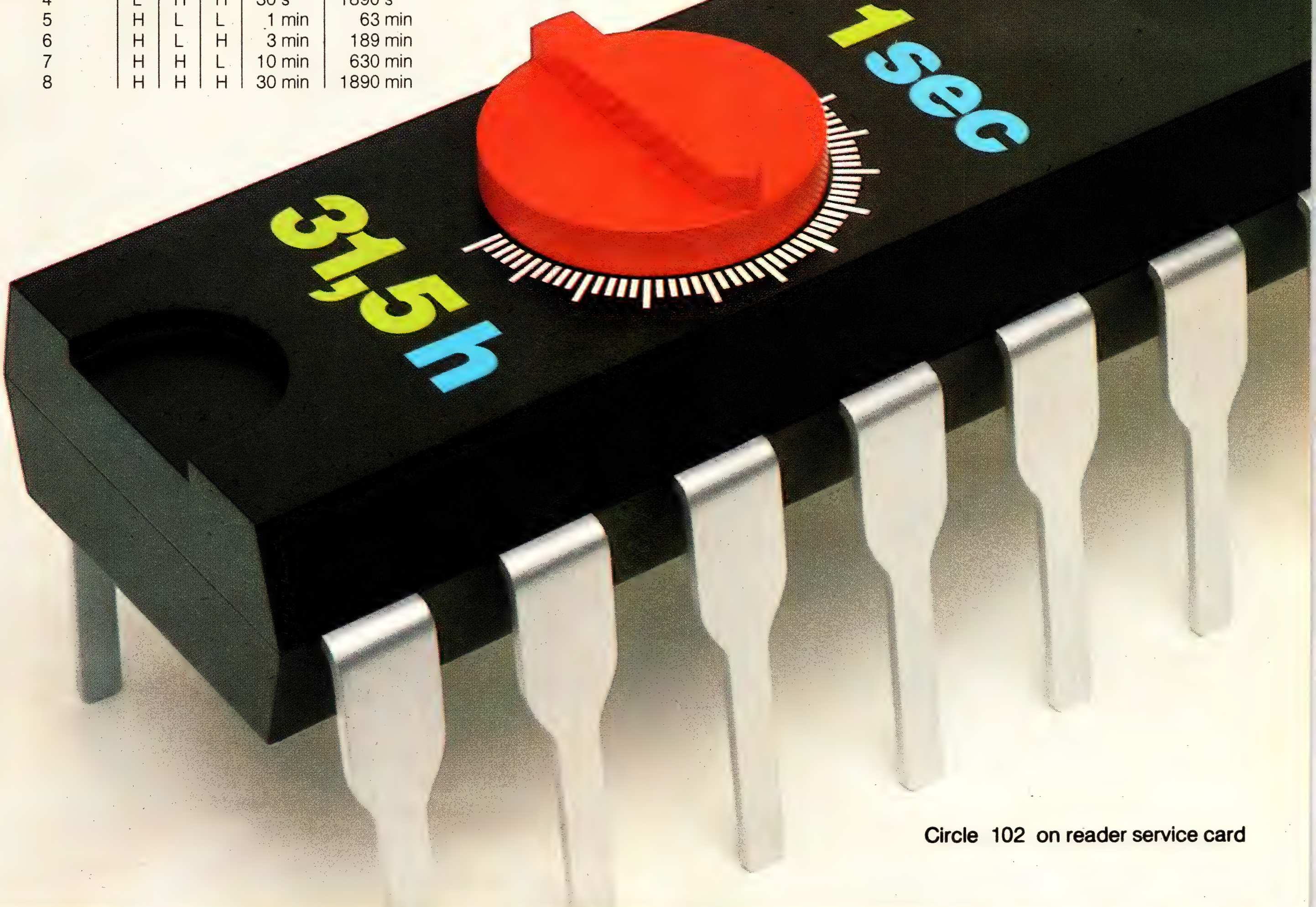
In industrial controller units, for example, safety switches for cooking equipment, coffee/espresso machines, hand-driers, bathroom ventilators, slot machines, stairwell lighting, alarm system, etc.

The programmable digital timer SAB 0529 from Siemens is the economic alternative to mechanical and electromechanical timers.

If you want to find out more, especially about possible applications, write to Siemens AG, Infoservice/B 8414, Postfach 156, D-8510 Fürth, West Germany, quoting "SAB 0529".

Siemens – your partner for integrated circuits

B 8414.101



Circle 102 on reader service card

On-line Semi

the broadest range

Choose choice.

Choose your technology... TTL, CMOS, ISL or ECL... we've got them all.

Choose your concept... we cover the board... everything from do-it-yourself integrated fuse logic through to sophisticated 3000-gate compact cell arrays.

Choose objective advice... we don't need to favour any particular technology or concept.

Choose your support level... we've got the biggest CAD network of its kind in the world, with off- and on-line interfaces adapted to individual needs.

Tailored support

1) you can deliver the logic diagram to your local Philips design center and we'll take care of the rest... everything from code development through to the supply of mask and test tapes

2) you can work in the design center, with or without the help of our engineers, and develop code on-the-spot

3) you can work with one of our terminals in your own office and run the simulation program yourself

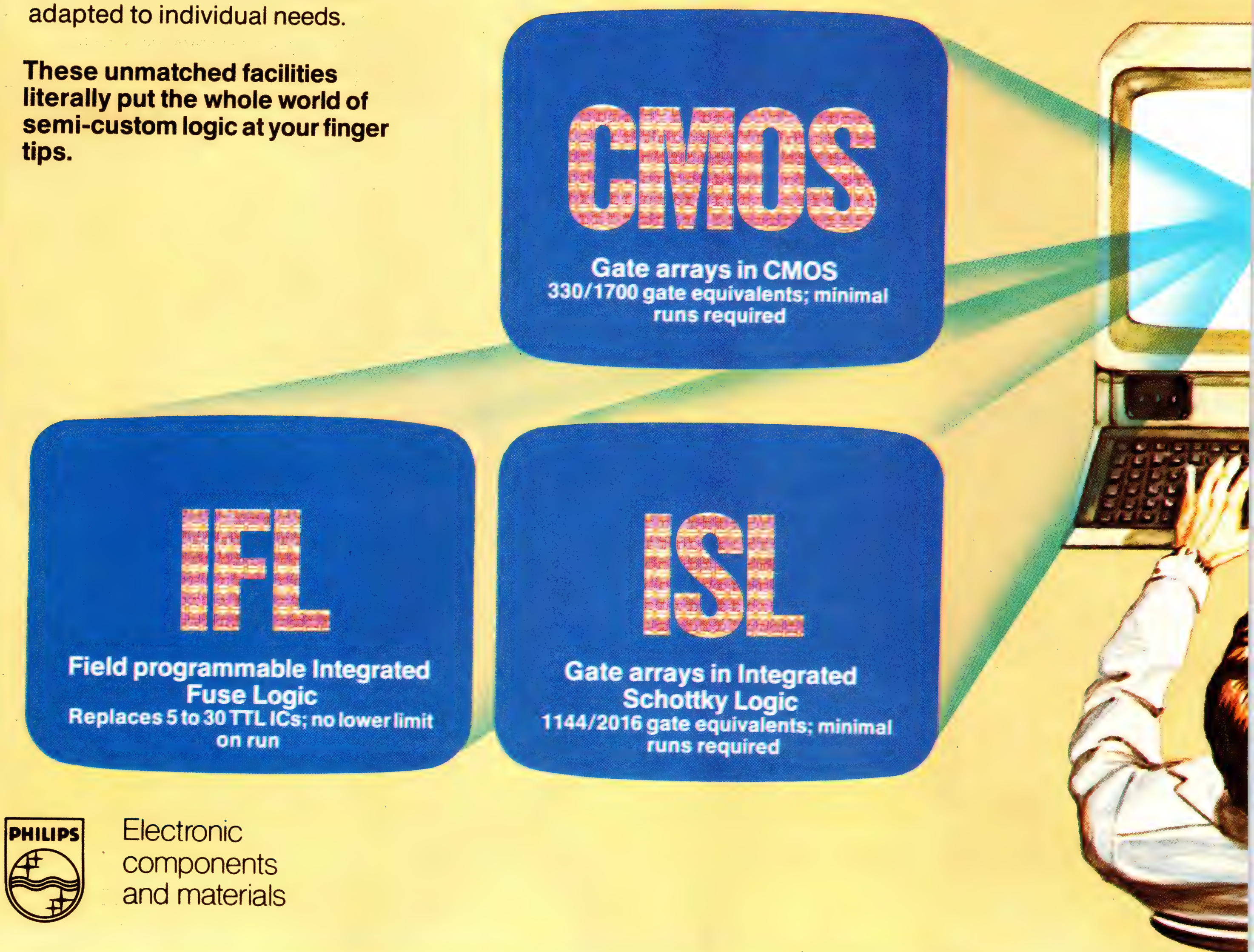
4) you can run Philips CAD software on your own computer and supply the tapes to us, from which we'll fabricate your ICs.

Support that's fast

In most cases a feasibility study to define which technology, which concept (gate array or cell library) and which size (in case of gate array), can be done in a few days. Code development only takes a few weeks.

Simulation is performed with fully-characterised logic models which establish worst-case timing and operating conditions. This allows us to guarantee that a circuit will perform as simulated. Following simulation, powerful and proven CAD tools are used to ensure an error-free design before silicon is touched.

These unmatched facilities literally put the whole world of semi-custom logic at your finger tips.

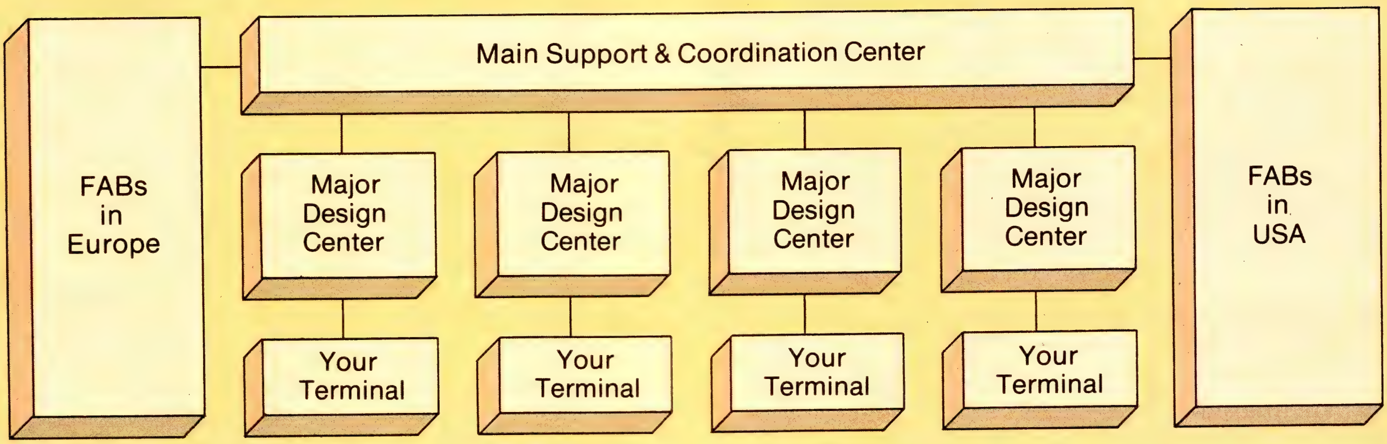

CMOS
Gate arrays in CMOS
330/1700 gate equivalents; minimal runs required
IFL
Field programmable Integrated Fuse Logic
Replaces 5 to 30 TTL ICs; no lower limit on run
ISL
Gate arrays in Integrated Schottky Logic
1144/2016 gate equivalents; minimal runs required

PHILIPS

Electronic
components
and materials

Custom Logic

... the best support



Now you can go on-line to the biggest CAD network of its kind in the world.

Terminals are at your disposal in our major design centers where you can work with or without the help of our design engineers. These centers are currently located in Hamburg, London, Paris and Eindhoven.

Alternatively you can have a terminal in your own office and run simulations yourself. Via such a terminal you'll be connected to powerful main-frame and host computers in the design and main support centers plus our FABs in Europe and Silicon Valley in the States.

ACE

Gate arrays in Advanced Custom Emitter Coupled Logic
600 to 2200 gate equivalents; minimal runs required

CCL

Cell library in TTL Composite Cell Logic
Up to 500 gates; minimal runs required

CCCL

Cell library in CMOS Compact Cell Logic
Up to 3000 gates; volume runs required

For details contact:
Philips Electronic Components and
Materials Division, 5600 MD
Eindhoven, The Netherlands.

PHILIPS

Circle 103 on reader service card

A McGraw-Hill Electronics Publication

ComputerSystems
EQUIPMENT DESIGN

This bi-monthly magazine offers advertisers a unique way to target their messages to 25,000 electronic design engineers concerned specifically with the design and manufacture of computers and computer systems.

It will be devoted entirely to international coverage of this important segment of the electronics industry. It will be produced by its own experienced team of technical editors. They are dedicated to providing readers with the most technically complete and accurate information available. Typical contents of each issue are as follows:

Representative table of contents.

Industry news and trends.

Systems: IBM links micros to mainframes
Military turns to rugged VAXs
Microcomputers: Portables set to lab the market
Software: Symphony debuts as siblings of 1-2-3
DOD mandates use of ADA
Peripherals: Voice recognition boards make their way in marketplace
Touch screen system cuts transaction time
Components: Gallium arsenide ICs aimed at Japan's 1990 computers
Honeywell to use NCR/32 chip set

Technical articles.

System packaging and board design in the IBM 4381, by Robert Smith and Jack Jones, IBM Data Systems.

Designing gate array logic with a personal computer, by Harvey Firestone and Paul Muni, Futurenet Corporation.

Error correction and detection in magnetic media, by George Herman, 3M Corporation.

A superminicomputer with powerful graphics, by Isaac Schwartz, Pyramid Computer Corporation.

Designers Notebook: Microcontroller drives two disk drives; Evaluating stepper motors.

New products.

Systems
Peripherals
Subassemblies
Components
Services
Software
Test and Measurement
Materials
New Literature

Departments.

Editorials
Letters
Meetings
New Books

Special 1984 introductory rates.

Ad size.	ElectronicsWeek advertisers.	Non Electronics-Week advertisers.
1 page:	$1,000	$1,500
2/3 page:	750	1,125
1/2 page:	620	930
1/3 page:	400	600
1/4 page:	320	480
1/6 page:	220	330

Cover rates.

4th cover:	$2,160	$2,635
3rd cover:	1,710	2,260
2nd cover:	1,810	2,410

Color charges.

Two color, standard:	$305
Matched 2nd color:	510
4 color process:	610
4 color process spread:	950

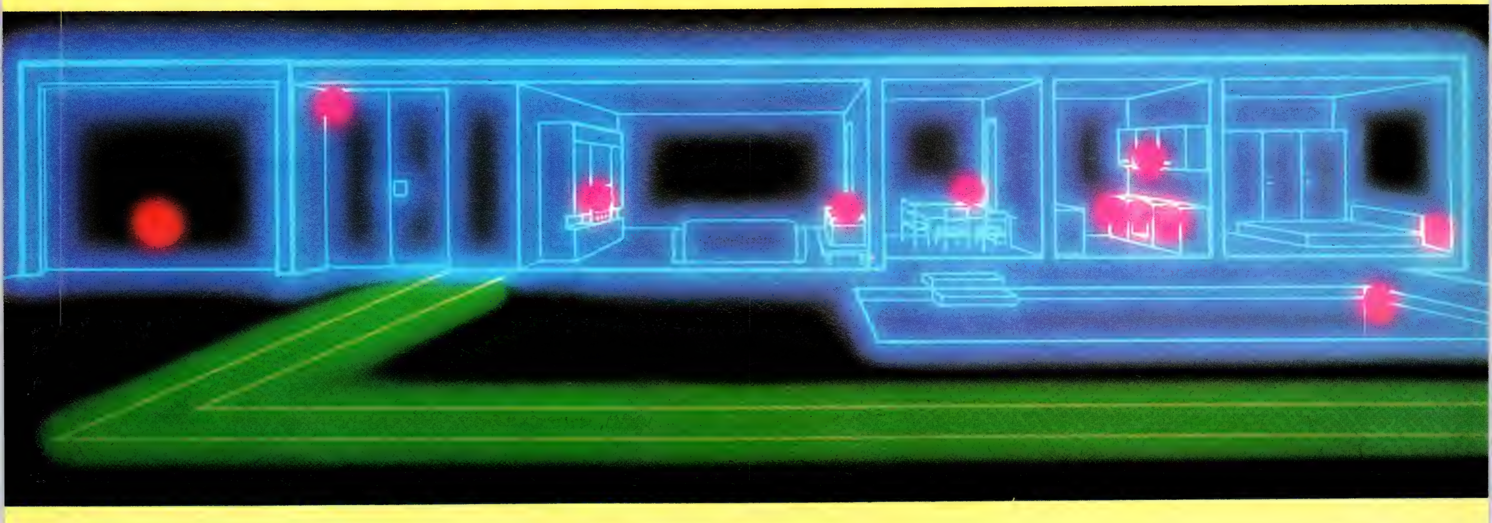
1984 Issue dates.	1984 Closing dates.
November 1, 1984	October 1, 1984

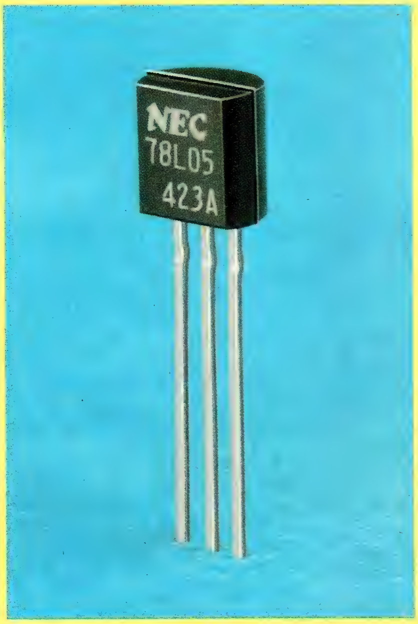
For space reservations, call Production Dept.,
McGraw-Hill Electronics Publications, (212) 512-3140,
1221 Avenue of the Americas
New York, NY 10020

Circulation: 25,000 computer systems equipment design engineers worldwide.

NEC

Controlled Relationship.





You are a manufacturer of quality equipment, of high value domestic appliances for example. Your customers expect your ongoing guarantee against operating problems, over voltage, thermal overload, and of course protection from short-circuits. It all points to the new **voltage regulator series µPC 78LXXJ** from NEC, the quality components to keep your servicing costs low and your customer confidence high.

Designed for positive voltages and almost indestructable. Space saving in the world standard TO-92 package. For output voltages of 5, 8, 12, and 15 volt at more than 100 mA. Enabling you to control directly on your circuit board and eliminating external components.

The **voltage regulator series µPC 78LXXJ** comes with the proven quality of all NEC products: best reliability thanks to the highly automated production process, great functionality as a result of innovative design.

Electronics from NEC – Quality for your Products.

® electronica 84

Munich, 13.-17. Nov. 1984
Hall 25, Booth 25C58

NEC
West-Germany: Düsseldorf 02 11/65 03 01, Telex 8 587 419
The Netherlands: Eindhoven 0 40/44 58 45, Telex 51 923
France: Paris 01/6 09 90 04, Telex 2 03 544
Italy: Milano 02/6 70 91 08, Telex 315 355
Sweden: Täby 08/7 56 72 45, Telex 13 839
UK: Motherwell 06 98/73 22 21, Telex 777 565

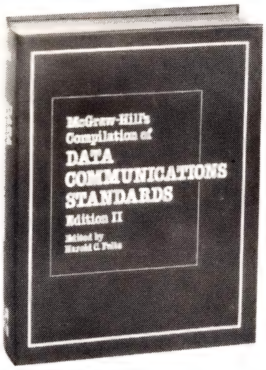
PRW

Circle 109 on reader service card

NEW EDITION

Complete and Unabridged American and International

DATA COMMUNICATIONS STANDARDS



All standards are new, revised, or reaffirmed since the previous edition

1,923 pages
illustrated
Edited by Harold C. Folts

Presents all 123 interface protocol standards set by:
● International Telegraph and Telephone Consultative Committee (CCITT) ● International Organization for Standardization (ISO) ● European Computer Manufacturers Association (ECMA) ● American National Standards Institute (ANSI) ● Electronic Industries Association (EIA) ● U.S. Government (NBS and NCS)

Special feature for instant access:
Cross-reference tables of the standards of each group corresponding to those published by the others.

An essential reference for all who are exploring, planning, developing, manufacturing, or using data communications equipment or networks.

Return Coupon to:
Data Communications Standards II
Electronics Week Books
McGraw-Hill Inc.
Princeton Road
Hightstown, N.J. 08520
(Tel.) 609/426-5070

Send me ________ copy (copies) of **DATA COMMUNICATIONS STANDARDS EDITION II** at $250. U.S. orders please add local tax. McGraw-Hill pays regular shipping and handling charges on prepaid orders. Ten-day money-back guarantee applies.

☐ Check enclosed ☐ Bill me ☐ Bill company
☐ Company Purchase Order enclosed.

☐ American Express ☐ Visa ☐ MasterCard
__________ Interbank No.
Credit Card No. ________________ Expiration Date ______

Name
Title
Company
Address
City
State/Zip (U.S.)
Country (outside U.S.)

ELV

PMI International Offices

France
Bourns-OHMIC-PMI
01-203 96 33

Germany
Bourns-PMI
0711-21 740

Netherlands
Bourns-PMI
070-87 44 00

Switzerland
Bourns-PMI
042-33 33 33

United Kingdom
Bourns-PMI
01-572 65 31

Hong Kong, Korea, Taiwan, and Singapore
Bourns Asia Pacific
(03) 724-0386

Japan
Nippon-PMI
(03) 234-1411

Australia
RIFA Pty. Ltd.
(02) 570-8122

Austria
Ing. Otto Folger
0222-43 26 39

Belgium
Vekano N.V.
02-720 92 04

Denmark
Tage Olsen A/S
02-65 81 11

Finland
Insele Oy
80-73 57 74

Greece
Germanis Co.
01-821 58 25

Israel
Rapac Electronics Ltd.
03-47 71 15

Italy
Technic S.R.L.
02-569 57 46

Norway
A/S Kjell Bakke
02-83 02 20

Portugal
Telectra S.A.R.L.
19-68 60 72

South Africa
Allied Electronic Components
52 86 61

South Africa
Associated Electronics Ltd.
011 839 18 24

Spain
Sonelco S.A.
01-409 46 34

Sweden
Bexab Elektronik AB
08-768 05 60

Turkey
Nel, Nuekleer Elektronik Ltd.
041-30 15 10

Yugoslavia
Jugomineral
041-42 37 46

Eastern Europe
Ing. Gerhard Stoits
0222-245 74 12

® PMI

PRECISION At Precision Monolithics, only three things count: precision, precision, and precision.

We believe quality control isn't just the last step before shipping. It's the last, the first, and every step in between.

If you already specify our analog ICs, precision is part of your philosophy. But for us, it's even more.

It's our name.

Precision Monolithics Inc.
1500 Space Park Drive, Santa
Clara, California 95050, USA.
A Bourns Company.

®PMI

Circle 117 on reader service card

The choice of innovation thru technology

MHS has opted to develop high-performance circuits calling for the mastery in "state-of-the-art" technologies.

Remember September 1979. The creation of Matra-Harris Semiconducteurs. One objective from the very beginning: to produce advanced technology, multi-application, high-performance ICs.

An advantage: the guarantee of a promising future for the company, ahead of more powerful but less sophisticated competitors.

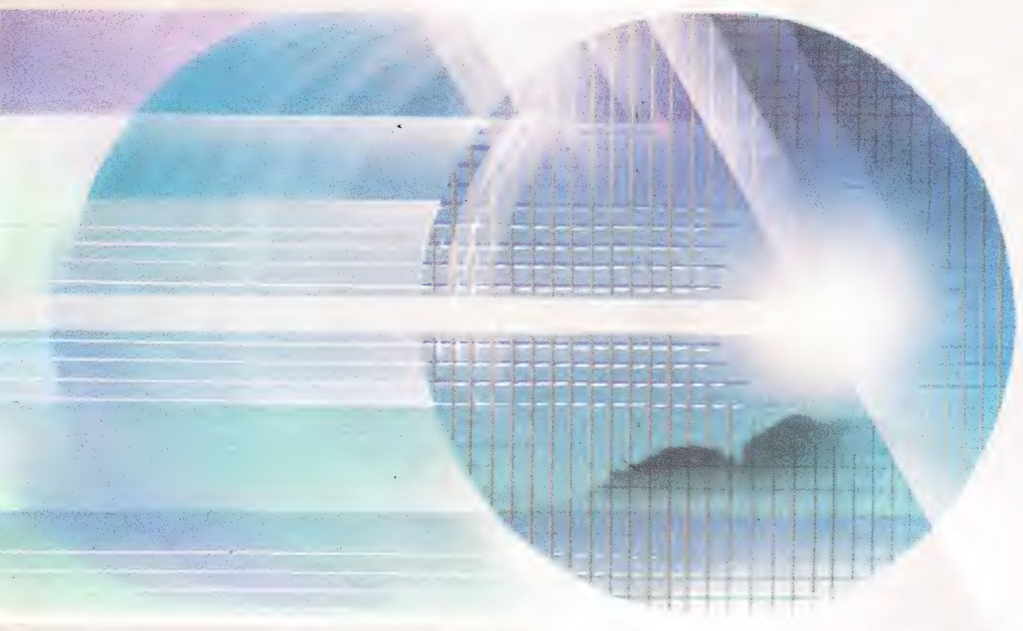
But one imperative: the necessity to have a permanent strategy of technological innovation and industrial expertise in order to attain the level of the "tenors" in the profession.

CMOS, 1.6 microns, 2 metal layers: the reference of a leader.

The decisive option for CMOS technology. The technology transfer agreements with Harris. A unique cooperation with Intel. And, of course, considerable human and technical efforts. All have contributed to make MHS a world specialist in thin lithography CMOS, and to obtain for its new circuits that very high integration density, so close to the micron, which places it amongst the Industry's leaders.

To create new circuits, to upgrade recognized industrial standards: the two options of innovation with a european touch.

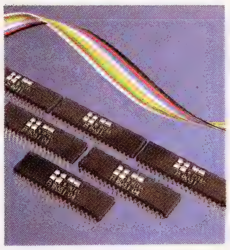
To develop 100% original circuits, design high-performance versions of standard circuits, convert entire lines of leading products into more advanced technologies. This is the ambition of the design teams. They have at their fingertips, at our Nantes and Santa Clara, centers a wide range of powerful and sophisticated EDP and graphic systems (2 Harris 500 computers, 2 VAX 780s, 2 CALMA systems). The product we propose here perfectly illustrates this strategy.



8051: An industry standard gears up a speed

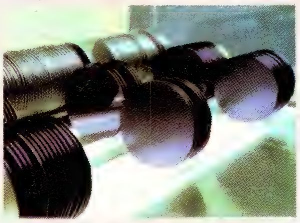
MHS is completing its line of 8051/12 MHz microcontrollers with a 15 MHz model.

You must surely be familiar with the 8051. This high-performance circuit is an 8-bit microcontroller using HMOS technology. For the first time, a 60,000 transistor VLSI circuit is being mass-produced to satisfy a worldwide demand. This microcontroller is a universal product used in most of all compact integrated systems.



3 more MHz means processing 25% more data.

Offered up until now at 12 MHz, the new model developed by MHS engineers provides even higher speed. Operating at 15 MHz, your systems will now be able to process 25% more data. In the fields of telecommunications, robotics, and industrial or military control systems, this additional performance combined with the 8051's recognized power and reliability, represents a major advantage.



8051/31: Immediate availability of a complete product range.

Production expertise is at the core of MHS's industrial strategy. This complete range, available in both plastic and ceramic packages in commercial and military versions, has been in mass-production for the last year at our Nantes plant. It is permanently available for users as a result of the regular and programmed increase in our production capacity. MHS is perfecting a standard, already highly sophisticated product and mass-producing a whole line of circuits in spite of the demand created. Thereby proving that it has well and truly become your main European source of performances.

8031/51	Temperature		Packaging
12 MHz	Commercial	0 to + 70 DEG C	Plastic / Cerdip
	Industrial	− 40 to + 85 DEG C	Plastic / Cerdip
	Automotive	− 40 to + 110 DEG C	Plastic / Cerdip
	Military	− 55 to + 125 DEG C	Cerdip
15 MHz	Commercial	0 to + 70 DEG C	Plastic / Cerdip
	Industrial	− 40 to + 85 DEG C	Cerdip

dpindustries

France
MHS
Les Quadrants
3, avenue du Centre 78182
St-Quentin-en-Yvelines Cedex
Tél. : (3) 043.82.72
Twx : 697317 F

Germany
HARRIS MHS
Erfurterstrasse 29
8057 Eching
Tél. : (49.89) 319.10.35
Twx : 5213866

England
HARRIS MHS
PO Box 27
153, Farnham Road
Slough ST. 1 4XD
Tél. : (44.753) 34.666
Twx : 848174

Italy
HARRIS MHS
via Fratelli Gracchi 48
20092 Cinisello Balsamo
Tél. : (39.2) 618.82.82
Twx : 311164

MHS

Source of performances

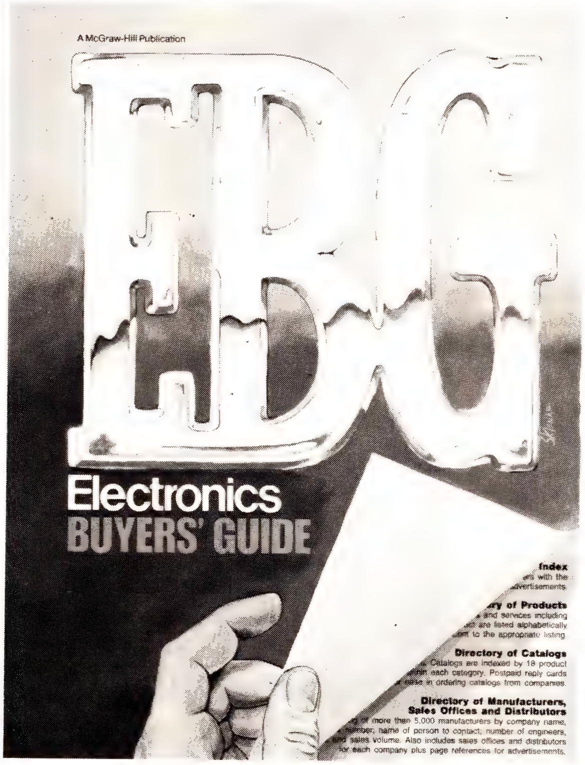
Circle 105 on reader service card

The *only* electronics directory you need…
1984-85 Electronics Buyers' Guide

Now available: 1984-85 Electronics Buyers' Guide. Completely new listings of catalogs, new phone numbers, new addresses, new manufacturers, sales reps, and distributors! The total market in a book—**three** directories in one!

1.

Directory of products. Over 4,000 products, over 5,000 manufacturers.


A McGraw-Hill Publication
EBG
Electronics
BUYERS' GUIDE
Index
Directory of Products
Directory of Catalogs
Directory of Manufacturers, Sales Offices and Distributors

2.

Directory of catalogs. Includes six post-paid catalog inquiry cards for 10-second ordering.

3.

Directory of manufacturers. Local sales offices, reps, and distributors, with phone numbers. Number of employees and engineers, dollar volume, name of company contact.

The only book of its kind in the field.

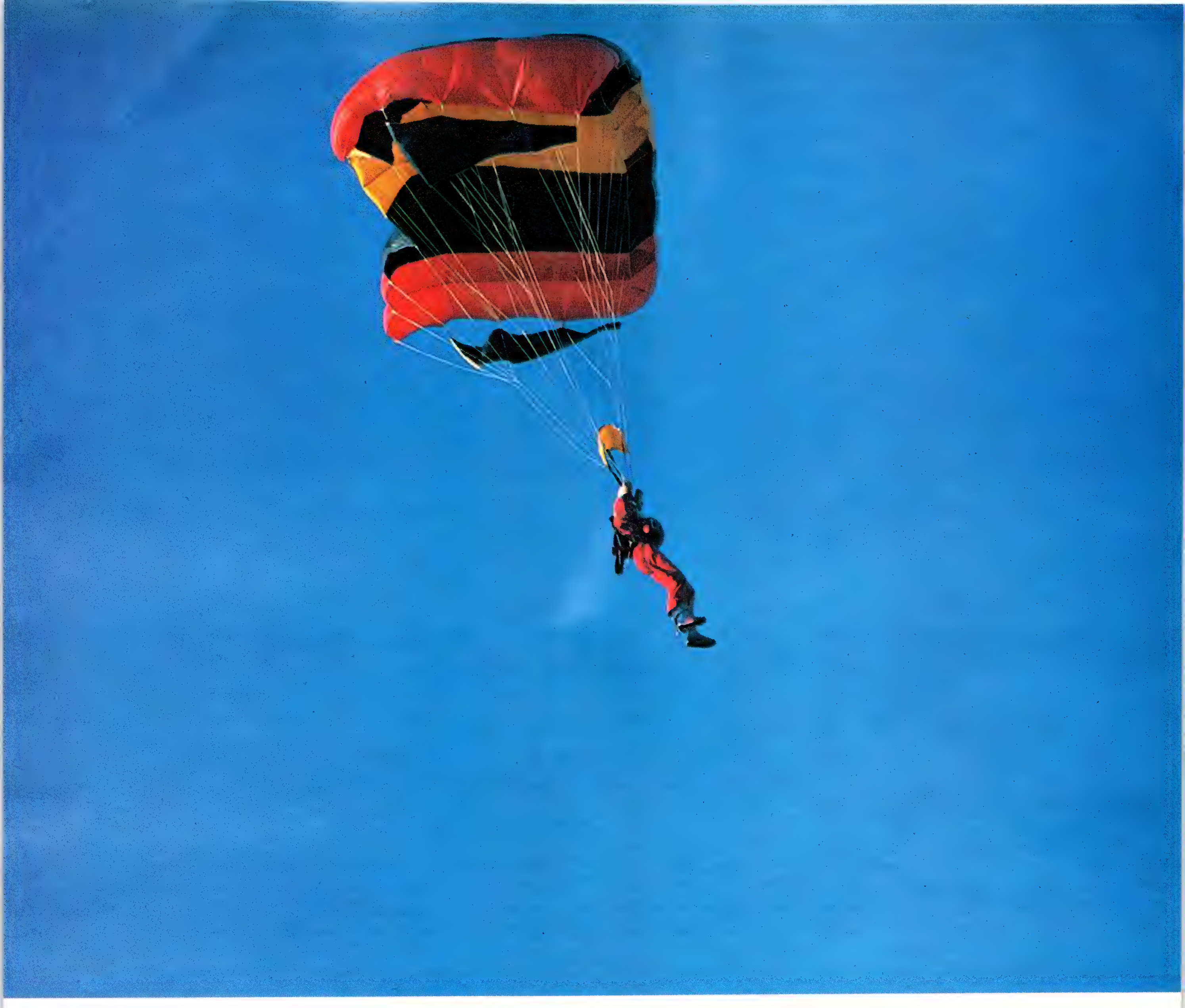
If you haven't got it, you're not in the market.

To insure prompt delivery enclose your check now.

Write to:
Regina Hera
Electronics Buyers' Guide
1221 Avenue of the Americas
New York, New York 10020

Enclose check for:
- $40 for each copy delivered in U.S. and Canada.
- $50 for each copy delivered elsewhere. (Add $20 for air mail).

Make Check payable to: Electronics Buyers' Guide.

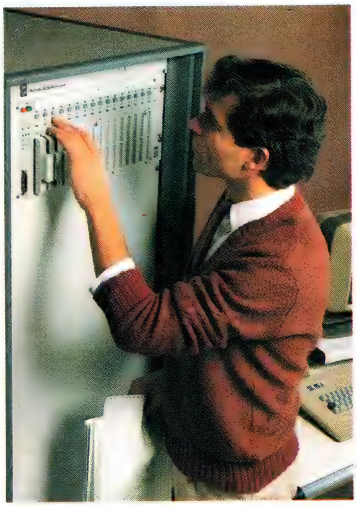


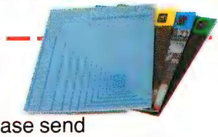
Aim your data traffic straight for the target: data link analysis by Wandel & Goltermann

Constant readiness and reliability of your data link are achievable only through planned care and systematic diagnosis. Look at our new DNE Diagnostic Network Control System and what it can do for you:

★ Patching of a monitor and analyzer such as our model DA-10
★ Looping in of a simulator (e.g. the DA-10)
★ Configuration reporting of your network
★ Display the key control signals of your data interfaces
★ Reroute and reconfigure data channels
★ Make fallback connections of channels and auxiliary modules, also preset emergency backup equipment
★ Report alarms, provide status displays and document events and system activities.

The DNE System can be tailored to your requirements for any size – from the basic manual system with 1 to 13 channels, to the high capacity system under remote computer control. The DNE will result in improved measurement routines on your data facilities and you will stay in control without messy cable arrangements. Clarity of connection begets secure communications links. Keep yourself informed about what is new from Wandel & Goltermann.





Please send
☐ Brochures on DNE systems
☐ Digest on datacom technology
☐ A sales engineer EL 24.9.84

Name ....
Company ....
Address ....
Country ....
Tel. No. ....

E 3267 KF

Wandel & Goltermann

P.O. Box 45 · Abt. VW
D-7412 Eningen u. A.
Fed. Rep. of Germany
Tel. +(49) 7121-8911
Telex 729833 wug d

Circle 111 on reader service card

PRECISE SENSING AT EVERY MOMENT

MURATA can help you promote security with its extremely sensitive ultrasonic sensors incorporating sophisticated ceramic processing and piezoelectric technologies.

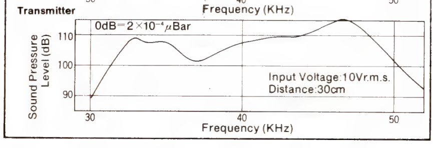
FOR BURGLAR ALARMS ULTRASONIC SENSOR

Total security is a crucial problem for all offices, banks, factories, research institutes, stores and all other enterprises. To eliminate this worry, sensors using ultrasonic waves have been developed that are inaudible to the human ear. Using its well-established, original ceramic processing and piezoelectric technologies, MURATA now presents two types of ultrasonic sensors, including model MA40L4 covering a maximum of 40KHz and model MA23L3 with a maximum of 23KHz, which will surely help promote security.

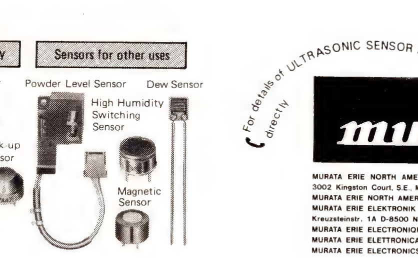
[The MA40L4: Unsurpassed range and sensitivity]

The wide-band type ultrasonic sensor, MA40L4, detects intruders by covering an extremely wide range of frequencies, from 35KHz to 47KHz. It features the most stable damping coefficient, 35KHz to 47KHz, and it also has the widest operating range and is fully resistant to moisture, vibration, shock, and extreme temperatures in any environment.

● Radiation Characteristics of MA40L4



● Frequency Characteristics of MA40L4



[MURATA provides circuit design technology using multipurpose MA40L4]

The MA40L4 not only detects intruders but also functions as an automobile back-up sensor to warn the driver of possible rear-end collisions and as an automatic focus sensor in many modern cameras. In addition to a complete line of sensor products, MURATA also provides clients with circuit design technology including the required custom specifications. A hybrid IC amplifier is also provided.

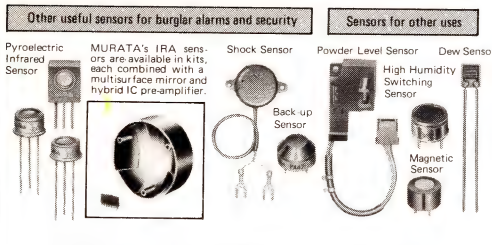
■CHARACTERISTICS

● Electro-Acoustic Characteristics

Nominal Frequency : 40kHz
Sensitivity : -73dB/V/μBar min.
Band Width : -73dB/VμBar min. at35~45KHz
Capacitance : 1400pF
Insulation Resistance : 100MΩ min.
Max. Input Voltage : 20Vr.m.s.

● Environmental Characteristics

Temperature Characteristics : Variation of sensitivity is within 10dB at -20° to 60°C
Humidity Test : Variation of sensitivity is within 3dB after 100 hrs. in 90 to 95% RH at 40°C test.
Shock Test : Variation of sensitivity is within 3dB after shock test; Sine 100G (6m sec) 9 times (3 times per direction × 3 directions).
Vibration Test : Variation of sensitivity is within 3dB after 6 hrs. of vibration test; Frenuency; 600 to 3300 rpm, Period; 1min., Amplitude; 1.5mm (2 hrs. for one direction × 3 directions).


Other useful sensors for burglar alarms and security
Sensors for other uses
Pyroelectric Infrared Sensor
Shock Sensor
Back-up Sensor
Powder Level Sensor
High Humidity Switching Sensor
Magnetic Sensor
Dew Sensor

MURATA's IRA sensors are available in kits, each combined with a multisurface mirror and hybrid IC pre-amplifier.

Circle 112 on reader service card

For details of ULTRASONIC SENSOR techniques directly

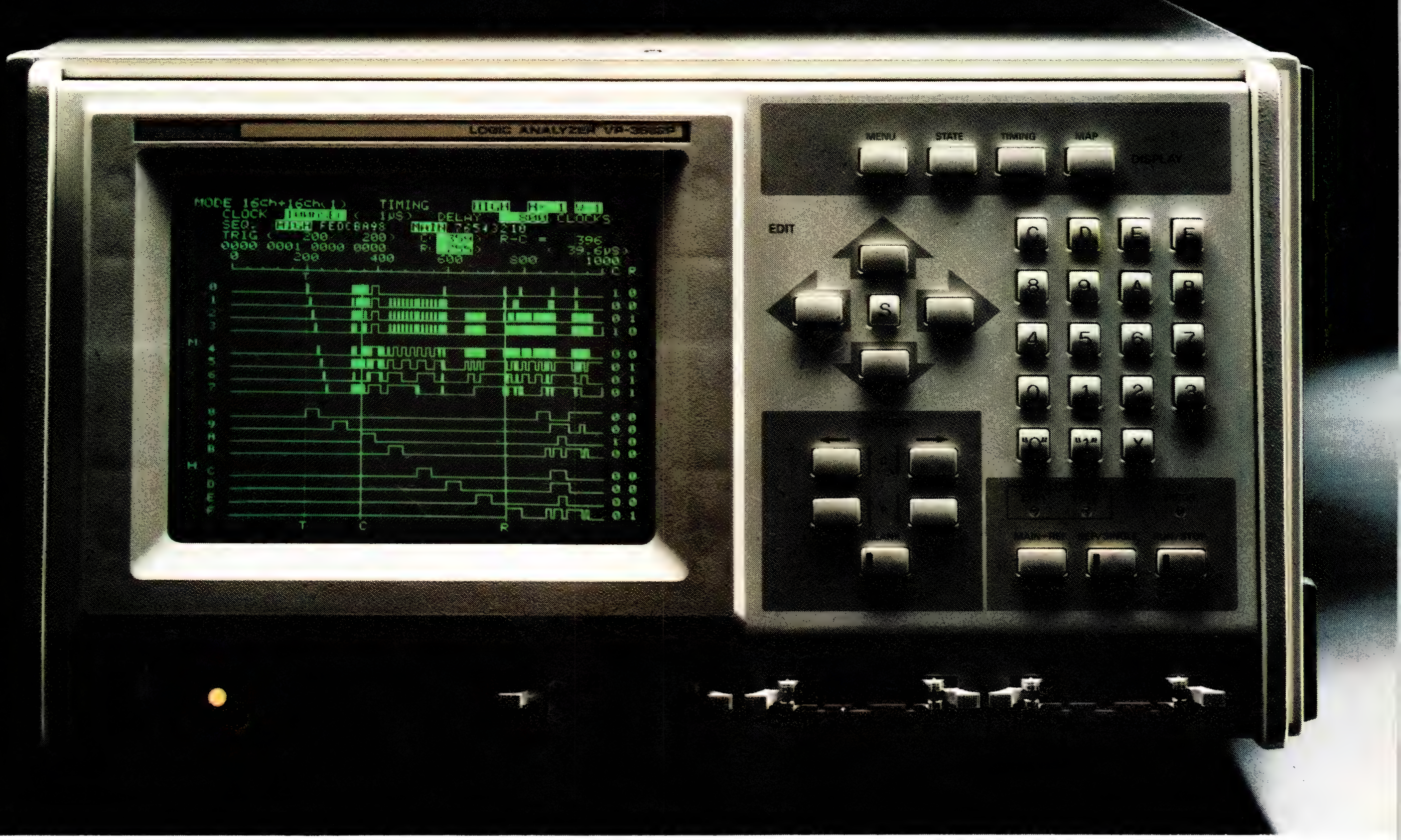
muRata ERIE

MURATA ERIE NORTH AMERICA, INC. ········ Phone:404-953-1799 Telex:542329
3002 Kingston Court, S.E., Marietta, GA 30067, U.S.A.
MURATA ERIE NORTH AMERICA, INC. CHICAGO OFFICE ········ Phone:312-297-5560 Telex:281009
MURATA ERIE ELEKTRONIK GMBH (West Germany) ········ Phone:0911-66870 Telex:623763
Kreuzsteinstr. 1A D-8500 Nurnberg 52, West Germany
MURATA ERIE ELECTRONIQUE S.A. (France) ········ Phone:024-6767 Telex:699954
MURATA ERIE ELETTRONICA S.R.L. (Italy) ········ Phone:688-4833 Telex:330385
MURATA ERIE ELECTRONICS (UK) LTD. (England) ········ Phone:2514-28585 Telex:858971

muRata
MURATA MFG.CO.,LTD.

HEADQUARTERS 26-10, Tenjin2-chome, Nagaokakyo, Kyoto 617 ··· Phone:075-921-9111 Telex:64270 MURATA J
MURATA ELECTRONICS SINGAPORE (PTE.) LTD. (Singapore) ········ Phone:2554233 Telex:21127
TAIWAN MURATA ELECTRONICS CO., LTD. (Taiwan) ········ Phone:042-91-4151 Telex:11348
(Taipei Office) ········ Phone:02-562-4218
MURATA COMPANY, LTD. (Hong Kong) ········ Phone:0-262099 Telex:56208
MURATA MFG. CO., LTD. Seoul Branch (Korea) ········ Phone:720-7605/720-7321 Telex:25858

The Logical Choice



Logic Analyzers with Multiple Functions— Simultaneous Hardware and Software Analysis/ Disassembled Mnemonic Display

When the chips (or other logic devices) are down, you need fast, accurate logic analysis, high-speed performance and multichannel capacity. Where can you get all this at a price you can afford? From Panasonic, of course. We give you a choice of 3 logic analyzers—the VP-3662A, VP-3661A and VP-3620A —to meet virtually any need in timing, state and microprocessor analysis. The sophisticated **VP-3662A** is the top choice with 100MHz high-speed resolution, 48 channels and real-time analysis, plus simultaneous 16-bit/ 8-bit microprocessor analysis and 100MHz/16-channel peripheral equipment timing analysis.

All 3 models feature an optional disassembled mnemonic display for 16-bit and 8-bit microprocessors (VP-3661A: 8-bit only), and optional RS-232-C serial data analysis. So whether you choose the VP-3620A, the VP-3661A or the VP-3662A, you can be sure that you've made the logical choice.

VP-3661A

- 32-channel high-speed analysis with maximum resolution of 100MHz.
- Disassembled mnemonic code display for 8-bit microprocessor software.
- Simplified data analysis with NAME display for each channel.
- Multiple display modes plus flexible trigger functions for easier debugging.

VP-3620A

- 32-channel high-speed analysis with maximum resolution of 20MHz.
- Disassembled mnemonic code display for 16-bit/8-bit microprocessor software (optional).
- Flexible trigger and versatile display functions for powerful debugging.
- Glitch trigger function for transients as narrow as 10ns.

National/Panasonic

Matsushita Electric Trading Co., Ltd. Industrial Electronics Section, P.O. Box. 18, Trade Center, Tokyo 105, Japan Telex: 522-8771 "METOSK J"

Circle 113 on reader service card

For Space Reservations
Call: Production Dept.
(212) 512-3140

ELECTRONICSWEEK
SPECIAL REPORT
OCTOBER 29

Magnetic Storage Technology

- Magnetic Media
- Magnetic Heads
- Read/Write Heads
- Head Positioning Mechanisms
- Vertical Recording
- The Latest Developments from 3M, Memorex, Kodak, others

Issue Date: October 29, 1984
Closing for Advertising: October 15, 1984

McGraw-Hill

ElectronicsWeek
The Voice of the Industry, Heard Every Monday

JUST PUBLISHED!

EASY, RELIABLE SOLUTIONS
TO YOUR DESIGN PROBLEMS

ORDER TODAY!

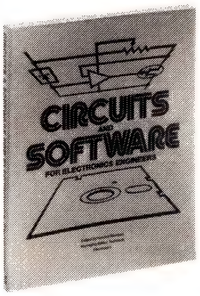
Focused strictly on design problems, **CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS** delivers professional, innovative solutions for your most demanding projects.

CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS covers a vast array of design problems conveniently organized into 25 vital categories by function.

CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS contains hundreds of circuit schematics and computer programs that have been proven to work and meet the highest standards of performance.

These creative, new ideas and approaches keep you on top of what's happening in the latest circuitry developments.

So whether you are a design engineer, technician or supervisor—don't take the chance of being less than on top of the latest circuitry developments! Order your copy today!



Edited by Howard Bierman,
Managing Editor,
Technical *ELECTRONICS*

Before you tackle your next project, order this valuable resource today!

Use the coupon or send in your company purchase order.

McGraw-Hill

McGraw-Hill Int'l. Publications Co.
Attn: ECC
McGraw-Hill House
Maidenhead, Berkshire SL6 2QL
England
(Tel. (0628) 23431; Telex 848640)

Send me ________ copy (copies) of CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS for $19.95 each. U.S. residents please include local sales tax.

☐ Payment enclosed (postage & handling included)
☐ Bill me (postage, handling & tax will be added) NOTE: All orders under $25 will be sent a proforma invoice requiring prepayment.
☐ Bill my company. Purchase order is attached.

Ship to:

Name ________________

Company ________________

Street Address ________________

City ________ State ________ Zip ________

Country ________________

Please allow four to six weeks for delivery. McGraw-Hill knows you will be satisfied, but if for some reason you're not, there is a ten-day money-back guarantee that applies on all books.

ULA*. The shortest route to custom LSI.

Custom LSI provides the ultimate benefits in economics, performance and design security.

Yet the route to custom LSI can be rather like trying to find the way through a maze.

The ULA cuts straight across this maze and is the shortest route to custom LSI.

Ferranti ULA technology combines:

☐ over a decade's experience with integrations in every major market sector.

☐ a product range second to none satisfying virtually all combinations of digital, linear, speed, complexity and I/O content at minimum power levels.

☐ the Ferranti Silicon Design System, the CAD facility covering the complete design cycle from system concept to silicon hardware.

In short, the ULA provides the economic, performance and security benefits of full custom LSI but in timescales and with development costs normally associated with gate arrays.

Take the shortest route to custom LSI, the Ferranti ULA.

For further information, contact

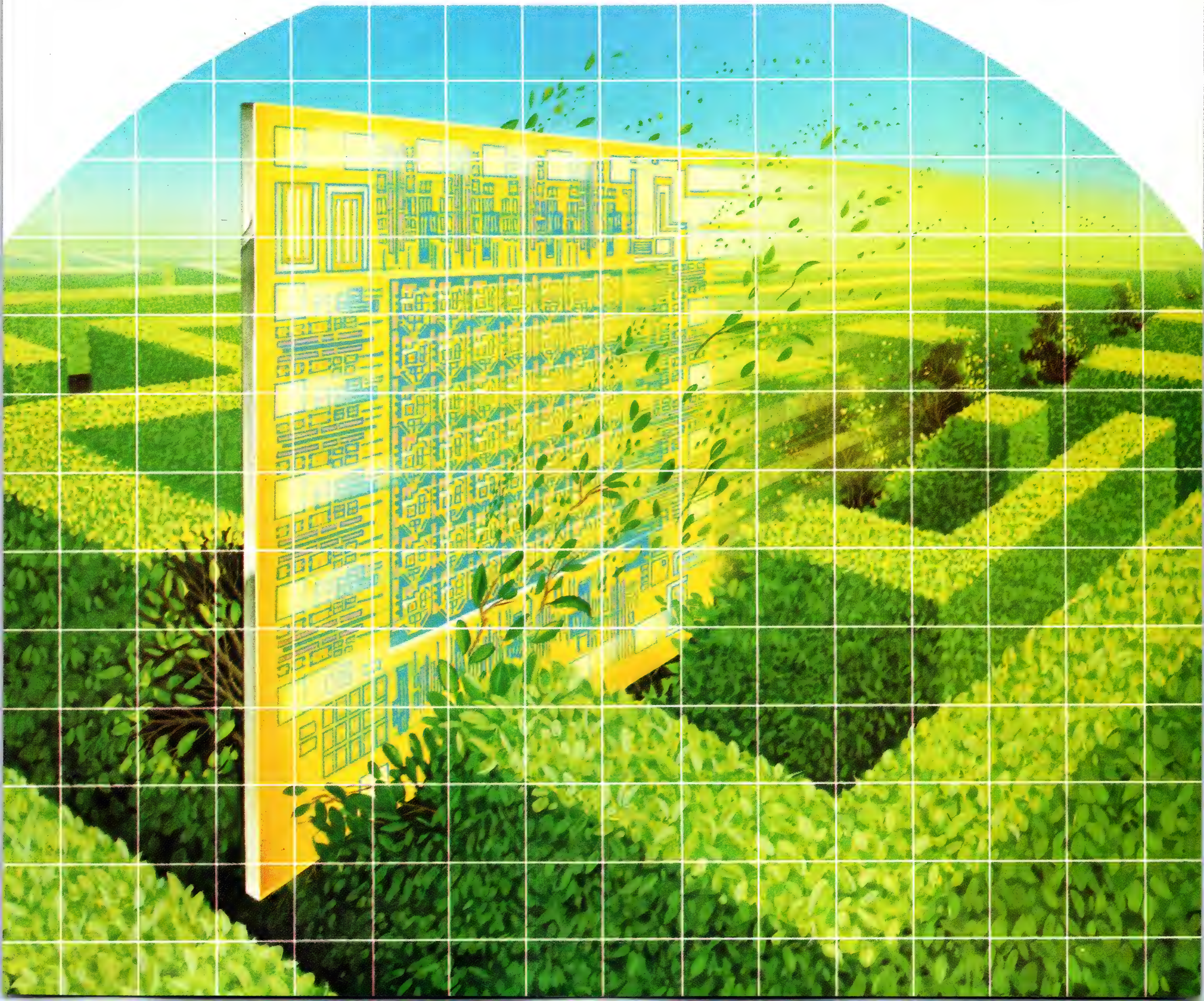
IC Marketing,
Ferranti Electronics Limited,
Fields New Road, Chadderton,
Oldham OL9 8NP.
Tel: 061-624 0515, Telex: 668038

BETTER
BY
DESIGN

FERRANTI
Semiconductors

Circle 115 on reader service card

*ULA is a registered trademark of Ferranti plc for semiconductor devices.



Breech-Lok®
Mil-C-38999 Series IV Connectors

Quick Coupling
Superior EMI/EMP — Shock — And High Vibration Performance
QPL Approved — Now Sold Internationally

BREECH-LOK® CONNECTORS
G&H TECHNOLOGY, INC.

Features:

- Superior EMI/EMP shielding (90 dB and better at 100MHz—70 dB at 10 GHz).
- Withstands greater shock (MIL-S-901C high intensity) with backshells.
- Higher vibration (to 3G²/Hz and better) with backshells.
- Scoop proof—all configurations.
- Quick coupling (90° to lock or unlock).
- Three full mate indicators (audible, tactile, visual).
- Standard shell types, sizes, contact-inserts & tools.
- Positive shell grounding prior to contact engagement.
- 4 to 128 contacts.
- 18 key polarizations.
- Hermetic, firewall, fiber optic, low price industrial versions and "Specials" also available.

G&H Technology, Inc.

750 W. Ventura Blvd., Camarillo, California 93010/USA, Tel (805) 484-0543, Telex 181095

Circle 116 on reader service card

ORDER TODAY!

EASY, RELIABLE SOLUTIONS TO YOUR DESIGN PROBLEMS

Design Engineers; Technicians; Supervisors; This book is for YOU!

CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS can save you development time and money by giving access to stimulating, clever approaches that speed creative design concepts.

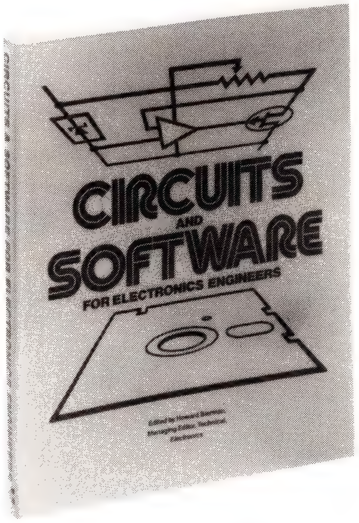
CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS covers a vast array of design problems conveniently organized into 25 vital categories by function, including:

> amplifiers, control circuits, instrument circuits, microprocessors and power supplies, plus software for computers and calculators.

CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS contains hundreds of circuit schematics, block diagrams, waveforms and computer programs that have been proven to work and meet the highest standards of performance.

You'll find valuable and reliable information on a variety of design problems including:

- exploiting the full potential of an rf power transistor
- interfacing a 10-bit a-d converter with a 16-bit microprocessor
- operating instrumentation-meter drivers on a 2-V supply
- interfacing opto-isolated RS-232 to achieve high data rates
- enabling a processor to interact with peripherals using DMA
- a programmable source sets the voltage of E-PROMs
- a TI-59 program tracks satellites in elliptical orbits
- an interface program that links a-d chip with microprocessors



Edited by Howard Bierman,
Managing Editor, Technical—
ELECTRONICS Magazine

These creative, new ideas and approaches keep you on top of what's happening in the latest circuitry developments.

Focused strictly on design problems, **CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS** delivers professional, innovative solutions for your most demanding projects.

This volume is essential to

- design appropriate circuitry to meet the most challenging specifications
- cut design time by adapting proven circuits and software to a wide range of applications
- save money and increase productivity by avoiding costly design errors.

So whether you are a design engineer, technician or supervisor—don't take the chance of being less than on top of the latest circuitry developments!

Before you tackle your next project, order this valuable resource today!

Use the coupon or send in your company purchase order.

McGraw-Hill Int'l. Publications Co.
Attn: ECC
McGraw-Hill House
Maidenhead, Berkshire SL6 2QL
England
(Tel. (0628) 23431; Telex 848640)

Send me ________ copy (copies) of CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS for $19.95 each. U.S. residents please include local sales tax.

☐ Payment enclosed (postage & handling included)
☐ Bill me (postage, handling & tax will be added) NOTE: All orders under $25 will be sent a pro-forma invoice requiring prepayment.
☐ Bill my company. Purchase order is attached.

Ship to:

Name ____________________

Company ____________________

Street Address ____________________

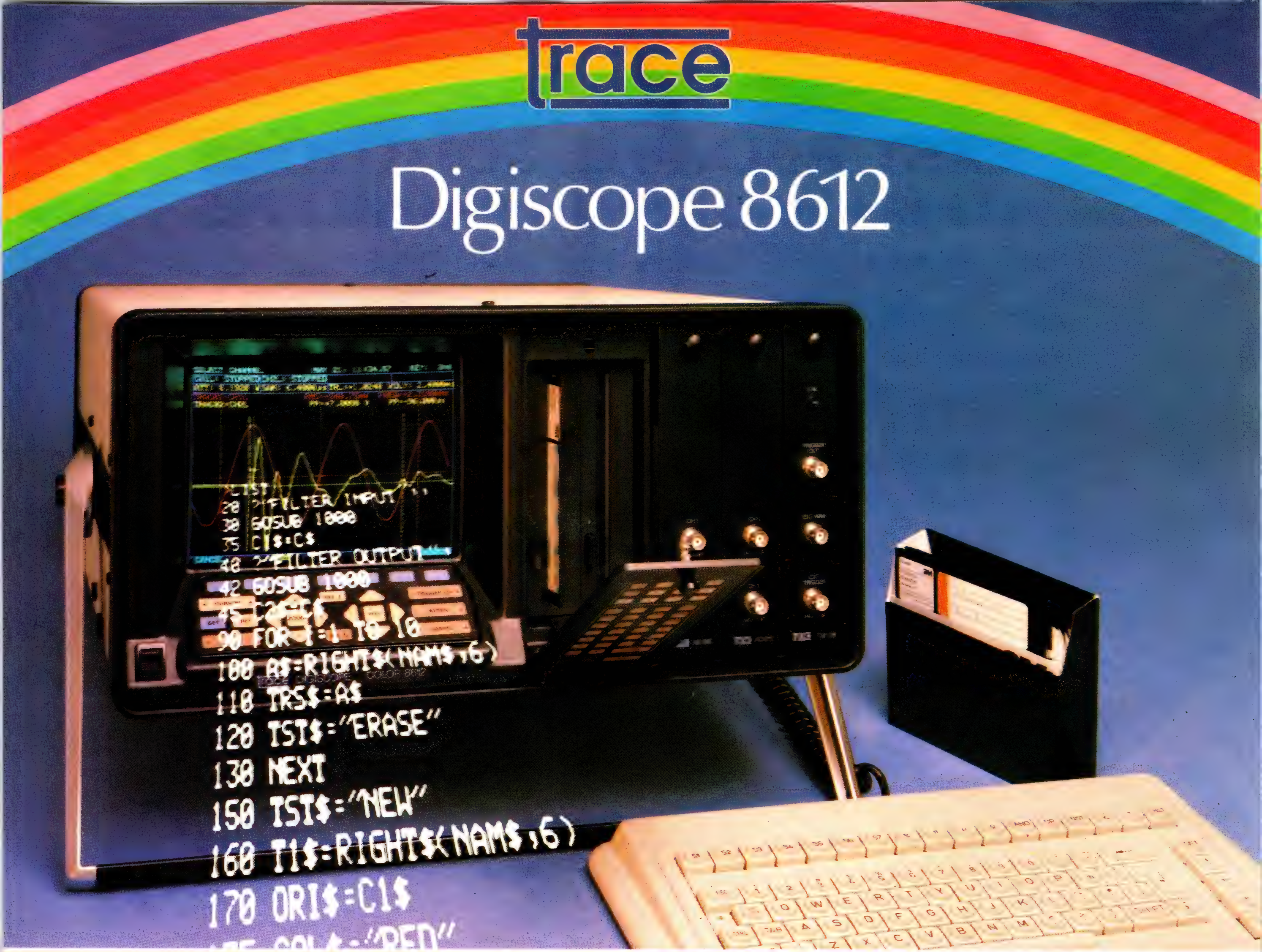
City ____________ State __________ Zip __________

Country ____________________

Please allow four to six weeks for delivery.

McGraw-Hill knows you will be satisfied, but if for some reason you're not, there is a ten-day money-back guarantee that applies on all books.

McGraw Hill



```
LIST
20 ?"FILTER INPUT",
30 GOSUB 1000
35 C1$=C$
40 ?"FILTER OUTPUT"
42 GOSUB 1000
45 C2$=C$
90 FOR I=1 TO 10
100 A$=RIGHT$(NAM$,6)
110 TRS$=A$
120 TSI$="ERASE"
130 NEXT
150 TSI$="NEW"
160 T1$=RIGHT$(NAM$,6)
170 ORI$=C1$
```

The intelligent BASIC programmable analog test and measurement system.

Signal Acquisition/Storage
The different plug-in-modules offer sample rates and resolutions of 1MHz–12 bit, 10 MHz–8 bit and 50 MHz–8 bit. They can be „mixed or matched" since the mainframe is frequency independent. The high-accuracy 1 MHz–12 bit plug-in has additionally differential inputs and, as the 10 MHz–8 bit plug-in, two independent input channels with 4K memory/each. Every input channel is completely independent with its own time base, trigger control (delay and level) and memory. The DIGISCOPE 8612 is the first unit to offer analog combinational triggering from up to 8 sources. The standard BASIC programming capability allows even program-dependent triggering on tolerances, curves etc.

Color Display
Seven (7) different colors allow a clear discrimination of multiple traces. Up to ten (10) traces can be displayed simultaneously and each one can be individually controlled with its own two cursors. Zooming in both directions (X & Y) allows expansions to 40 points and compressions to 32,000 points.

Actual Measurement
Each displayed trace offers two direct measurements (DVM or Counter/Timer). Since there are 10 traces possible, up to 20 precise measurements can be made simultaneously. The two cursors in each trace allow also for sequential measurements.

The DIGISCOPE 8612 can be programmed in BASIC and run test sequences or present the measurement results automatically. The built-in Floppy Disk Drives and the IEEE– and RS232-C–interfaces provide the necessary links to computers.

FFT-Analysis as well as fast and higher level arithmetic calculations can be achieved with the optional software package, AMS II.

Documentation
Data Storage, i.e. storage of set-ups, test results, waveforms and special test and evaluation programs, can be „arranged" in the built-in Floppy Disk Drives or externally through the different interfaces. Even a hard copy in full color is available through the COLOR VIDEO GRAPHIC PRINTER, which is connected to the RGB–video output of the DIGISCOPE 8612.

Circle 53 on reader service card

trace
Elektronische Geräte GmbH,
Tannhäuserplatz 2
A-1540 Wien, Austria
Tel.: 0222/95 91 72

BRD	**-089/852063**	**I**	**-02-90722441**
CH	**-01-2010711**	**NL**	**-073-218882**
F	**-6-9302880**	**S**	**-08-7390045**
GB	**-049441661**	**SA**	**-793-1275**
IS	**-3-494179**		

LEXIDATA GIRDS FOR NEW BATTLES AFTER ITS CHIEF EXECUTIVE QUITS

Boston

When the president of Lexidata Corp., in Billerica, Mass., resigned recently, eyebrows were raised. It wasn't so much that he resigned after a tenure of just 10 months. Rather, it was that this high-tech veteran broke an unwritten industry rule by publicly voicing doubts about the company's future.

But any doubts about Lexidata, which makes raster graphic display processors and subsystems, might just as easily apply to many other firms in the graphics systems business. All of them are—or soon will be—hard-pressed by the growth of engineering work stations, which are capturing an increasingly large share of the computer-aided design and manufacturing market. Engineering work stations have not only graphics ability, but also more computing horsepower and function, while running without the need of a host.

Lexidata was attempting to join the numbers of work station manufacturers before Andrew Knowles resigned. Knowles was particularly discouraged when attempts to raise venture capital for the company's proposed engineering work station failed and the project died. For Lexidata, the project's collapse mandated a radical rethinking of how to proceed over the long run.

Record pace. Skepticism about the company's future has come soon after it set a record pace in the first six months of fiscal 1984 (through March), with sales of $17.4 million, up 55% from the year before. Ross Belson, the new president, believes sales for this year will be up more than 30% over last and says the firm can continue to move forward and expand in its traditional business—supplying graphics terminals in the growing CAD/CAM market.

Not too long ago, in fact, 10-year-old Lexidata seemed to be on a roll. From 1981 to 1982, sales jumped from $14 million to $28 million and profits rose 50%. But in 1983, sales fell to $25 million, and the company reported a loss of $181,500. (In the first nine months of fiscal 1984, it lost $21,000 on sales of $26.8 million.) Those close to the firm say the need for a shift in direction was evident long before it posted a loss.

"Companies in the peripherals business, whether graphics or nongraphics, are always susceptible to vertical integration as well as to others entering the market with cheaper products," notes Ralph Linsalata, president of Lexidata from 1979 to 1983 and still a board member. "You knew from day one that the peripheral business was limited."

But knowing that does not make it easy for firms to reposition themselves in the marketplace. "If you decide to become more and more of a [complete] system [vendor], you compete with your own customers. You can't integrate back because then you're into semiconductors."

The trick is to integrate forward without losing existing business, he says. Lexidata put an engineering work station on the market early in 1983, but the product was soon pulled back. "We didn't have enough computer knowledge," says Linsalata. The product's major problem was that it did not have a standard bus, and this made it necessary for Lexidata to do the interfacing when a user wanted to hook up a peripheral. The mistake "was so obvious after we did it," he says. "I just couldn't believe it."

Planning. Ross Belson, new head of Lexidata Corp., believes the firm will move off in related directions as it regroups after the resignation of its former president.

New head. By the end of 1983, Knowles, who had been at Digital Equipment Corp. for 14 years, was brought in. Knowles believed his role was to move Lexidata into engineering work stations. But at the time, he says, the market was flooded with work stations. "You don't want to be a JAWS—just another work station [manufacturer]. What we were preparing was the next generation of work stations."

Full development of the work station would have required in excess of $25 million, and that kind of money was not available when Lexidata went looking in March and April of this year. Without the funds, Knowles says, "There was nothing left for me to do with respect to why I was hired. . . . [Lexidata] is between a rock and a hard place" for its future direction. So he resigned.

Knowles' assessment is shared by industry analysts. Gordon Richardson, a senior professional staff member at Arthur D. Little Inc., Cambridge, Mass., says that in the late 1970s and early 1980s, Lexidata's products "were well ahead of the pack" in the high-performance graphics systems market. "Lexidata had a very short window, and they hit that."In order to win [now], they will have to out-Apollo Apollo," he says, referring to Apollo Computer Inc., Chelmsford, Mass., a leading vendor of engineering work stations. "It's a very tough thing to do. . . . There are quite a few companies in that pickle now."

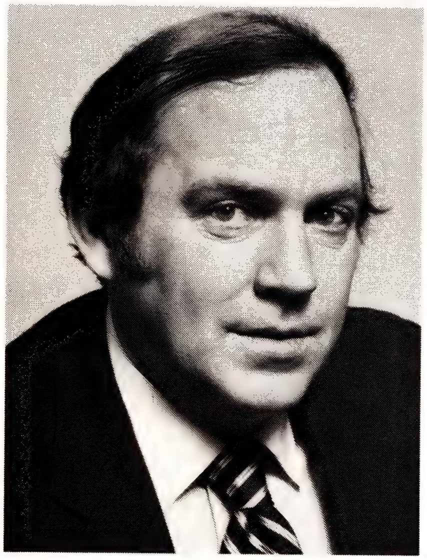
Richardson believes one possible route for Lexidata is to become a components supplier to a firm that is putting out a complete system. But he adds, "I would hope that companies like Lexidata are looking at the unobvious strategy."

In the future, Lexidata could supply products to manufacturers of engineering work stations, says Belson. Another option would be to offer high-end graphics products to be added onto work station packages. "We will try to generate business volume through either channel."

The firm must also move into new areas. This may involve horizontal moves to areas of the CAD/CAM market not under attack by work stations, says Belson, mentioning military, mapping, seismic, and petrochemicals as possibilities. The applications in those areas often requires large host systems, he says, so they don't fit on current work stations.

"This is the year for mapping out new directions. I don't see it as a radical departure from what we've been doing well, but as a move off in related directions." **-Craig D. Rose**

Distributor's dream becoming reality as sales head toward $150 million



Thriving. William Kelly, founder and sole owner of Semispecialists of America, sees his distribution firm expanding further in the next few years.

Farmingdale, N.Y.

Ten years ago, William Kelly had a bold objective for a man with only $10,000, a 10,000-ft² building, and five employees. He set his heart on becoming the most profitable U.S. electronic components distributor.

By 1980, his firm, Semispecialists of America Inc., was selling active and passive components at a rate of about $10 million a year. Sales tripled within two years and ballooned to $105 million by 1983. When 1984 closes, SAI expects sales to top $150 million—the equivalent of ringing the weighted bell in the business. "We're right on target," says Kelly, who owns 100% of the firm.

Though Kelly, who keeps an armed bodyguard in proximity and a number of relatives on staff, speaks confidently, several industry observers don't believe the sales figures he reports. Requesting anonymity, one analyst says he'd be surprised if SAI does more than $50 million worth of business yearly, and a competitor says, "Kelly is blowing smoke."

The company is well aware of the doubts about its sales figures. "I think its a hard pill for a lot of guys to swallow," remarks Frank Kelly, the founder's brother and an SAI executive.

William Kelly pegs the firm's gross profit at about 30% of sales. As for the amount of money he takes home annually, "Only me and the IRS know that."

Hefty earnings. SAI's income statement for 1983 does show sales of $105.8 million for 1983, and judging by its claims for the first half of 1984, the firm will hit the $150 million mark.

One executive, Jeff Curlander, corporate vice president for advertising and communications, claims that competitors doubt the sales figures and criticize SAI because it was started as a broker that purchased from original-equipment manufacturers and other distributors, rather than from manufacturers. "We're still looked upon as a broker, but we only broker 5% to 10% of our parts now," he states. "I don't know a distributor who doesn't broker—but most won't admit it," he remarks.

SAI distributes about 50 to 60 passive and active lines. A broad range of semiconductors contributes about 70% of its revenues, while passive components account for the remainder. The company has secured contracts for 52 franchised lines, such as Raytheon, Rockwell, and General Instrument, its president says, up from about 12 last year.

"Our success is too simple for most people to believe," states Kelly, who invests the bulk of SAI's income in real estate and donates portions—usually anonymously—to various charities. In addition to hiring family members, he correlates rises in sales with "overpaying employees." He awards commissions to managers, has a profit-sharing plan, and lets employees use company-owned condominiums in vacation spots.

Noting that the firm works to "service the hell out of our customers," Curlander says part of SAI's approach includes holding seminars relating to its products. Subjects addressed include soldering techniques, soldering surface-mounted components, and static control techniques in manufacturing.

Doing gate arrays. Down the road, SAI plans to enter the gate array market around the middle of 1985, when it hopes to have a properly trained engineering staff. "People doing gate arrays now have jumped the gun. That business won't start for a year or so," Kelly believes. When it does, though, distributors "will have to get involved in it."

A key ingredient in SAI's prosperity is staffing with Kelly relatives. About 20 are employed by SAI and range in position from vice president to branch manager. Younger kin are being groomed during summer vacations. Kelly claims his privately held company has never borrowed money for its expansions and will never go public. "If we went public, my mother would yell at me and not let me come home for Christmas."

Within two years, Kelly predicts, a shakeout will uproot over half the country's existing distributors. But he can't imagine anything but rock-solid earth supporting his firm and he remains as bold as he was 10 years ago. "We'll be around the seventh largest components distributor in 1985." **-Steve Haggerty**

For active or passive needs, a change to CLS can boost productivity.

If you're ready for another laser trim system and want to increase productivity and decrease problems, the system to add is the CLS-33. Built for high-volume, high-throughput demands, the CLS-33 is more affordable to purchase and more cost-effective to operate.

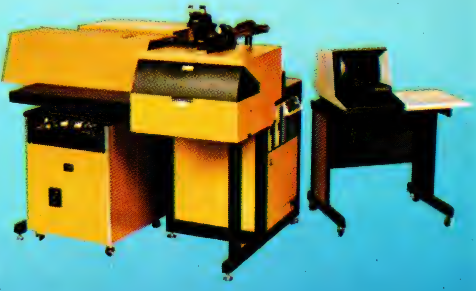
Even if you currently operate another manufacturer's trimmers, adding a CLS-33 can help you trim costs and enhance capabilities. Its many benefits can be applied to passive trims, or active trimming to ac and dc voltage or time parameters. It can even handle capacitance trimming; and an IEEE-488 bus interface module is available. An air-bearing step and repeat handler and a new cartridge feed stack loader are also optional.

In addition, the CLS-33 is trimmer in size than other systems. Its advanced design has made it smaller and less complex than the older generation of trim systems sold by others.

Designed as "the smart laser trim system," the CLS-33 is backed by the industry's most intelligent software operating system. So easy to use, unskilled workers can learn to program the system in just days.

For lower operating costs, Chicago Laser has taken extensive measures to minimize the chance of downtime. That process begins with well-proven designs and rigid quality-control standards. Chances of downtime are further reduced by the system's modular construction and advanced diagnostic programs.

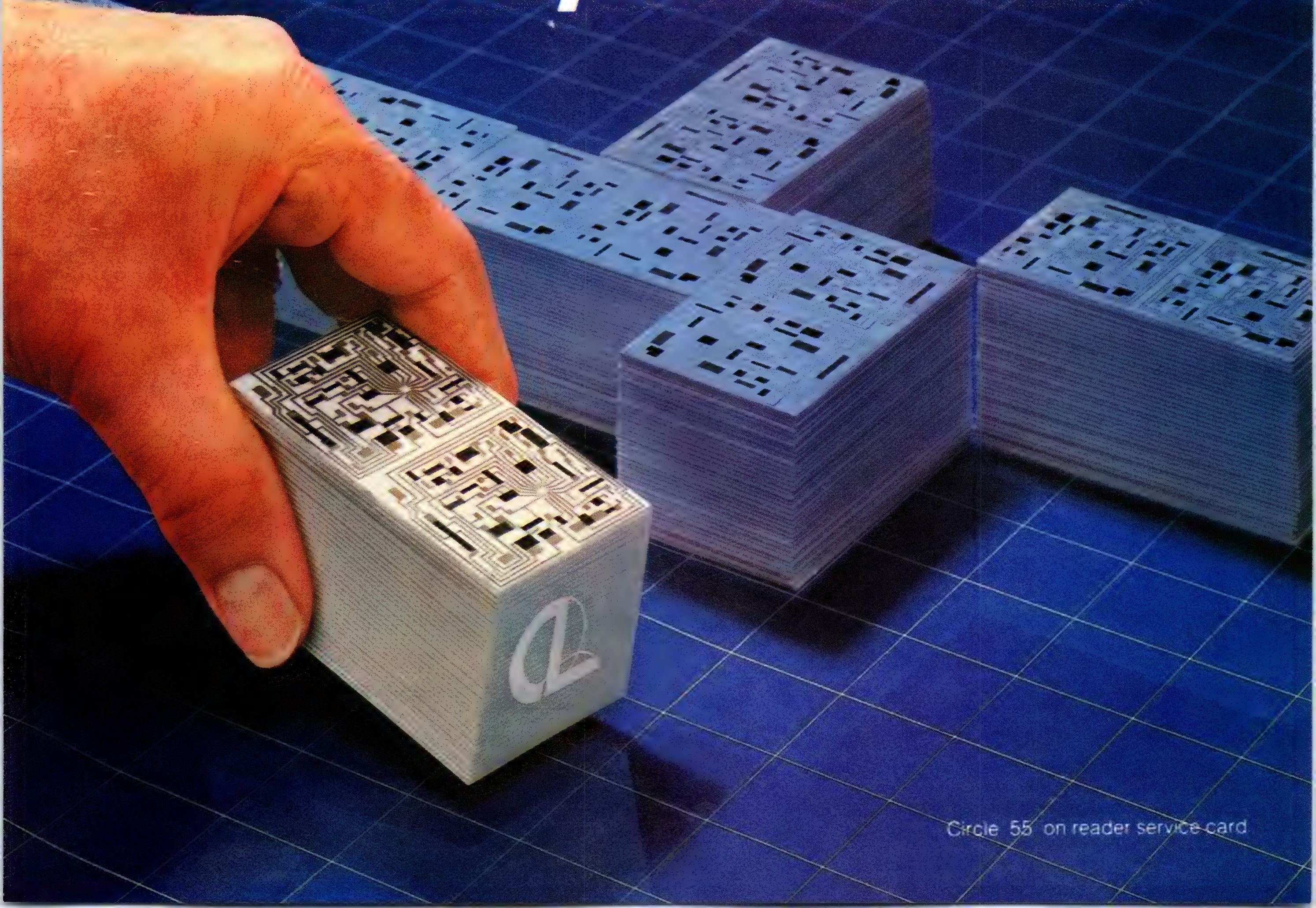
For a detailed appraisal of how the CLS-33 can fill your needs, contact Chicago Laser Systems.



Chicago Laser Systems Inc.

4034 N. Nashville Ave., Chicago, IL 60634 • Phone 312 • 282-2710 Telex: 206-647

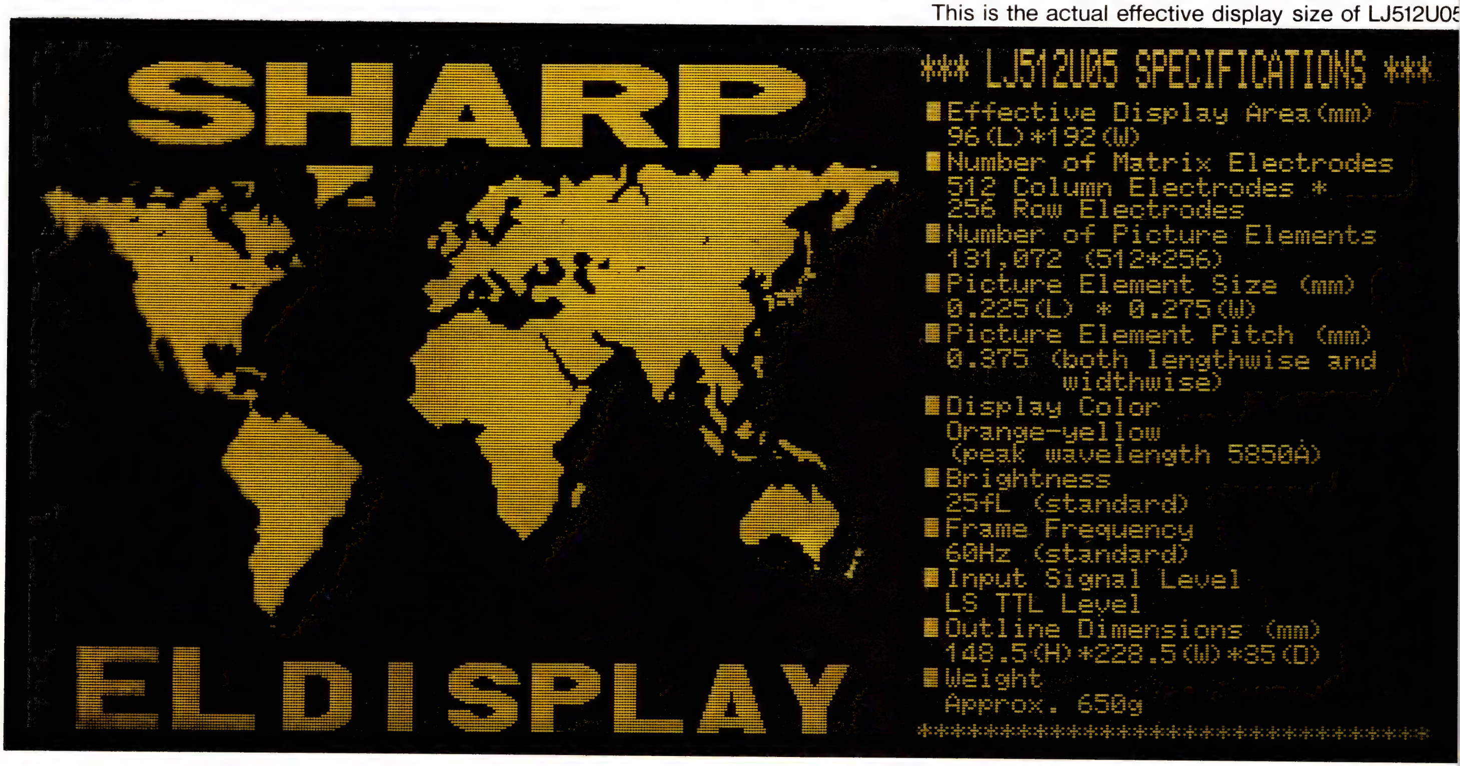
For lower-cost laser trimming, make CLS your next move.



Circle 55 on reader service card

25 LINES OF 80 CHARACTERS!
FLAT PANEL DISPLAYS AVAILABLE NOW!!

This is the actual effective display size of LJ512U05



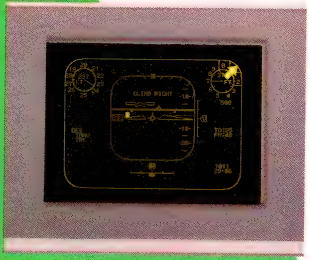
*** LJ512U05 SPECIFICATIONS ***
- Effective Display Area(mm)
  96(L)*192(W)
- Number of Matrix Electrodes
  512 Column Electrodes *
  256 Row Electrodes
- Number of Picture Elements
  131,072 (512*256)
- Picture Element Size (mm)
  0.225(L) * 0.275(W)
- Picture Element Pitch (mm)
  0.375 (both lengthwise and widthwise)
- Display Color
  Orange-yellow
  (peak wavelength 5850Å)
- Brightness
  25fL (standard)
- Frame Frequency
  60Hz (standard)
- Input Signal Level
  LS TTL Level
- Outline Dimensions (mm)
  148.5(H)*228.5(W)*35(D)
- Weight
  Approx. 650g

****

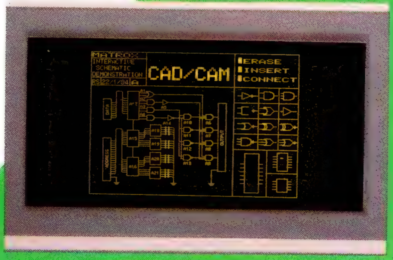
Sharp's full line of EL (Electro Luminescent) Displays are thin (34mm), lightweight (650 grams), low power (15 watts max) and the two latest editions can display 25 lines of 80 characters. These "State of The Art" Displays feature; line by line scrolling, blinking characters, full graphics and a simple 4 line interface. EL's bright, crisp, easy to read characters will enhance the marketability of any product.

Design the leading edge of display technology into your products today using displays from Sharp, the world's largest manufacturer of EL Displays!

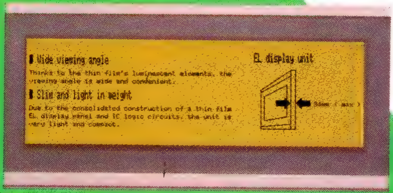
LJ 512U01 • Ideal for written characters • Effective display area: 44.8mm×179.2mm • Number of picture elements: 512×128 • Outline Dimensions (mm): 108.5(H) × 228.5(W) × 34(D)



LJ 320U01 • Ideal for fine graphics as well as written characters • Effective display area: 90mm×120mm • Number of picture elements: 320×240 • Outline Dimensions (mm): 148.5(H) × 178.5(W) × 34(D)



LJ 512U05 • Ideal for fine graphics as well as written characters • Effective display area: 96mm×192mm • Number of picture elements: 512×256 • Outline Dimensions (mm): 148.5(H) × 228.5(W) × 34(D)



LJ 640U01 • Ideal for written characters • Effective display area: 60mm×192mm • Number of picture elements: 640×200 • Outline Dimensions (mm): 108.5(H) × 228.5(W) × 34(D)

EL DISPLAY

SHARP
SHARP CORPORATION, JAPAN

Circle 56 on reader service card

SHARP CORPORATION International Business Group, Electronic Components Sales Dept.
22-22, Nagaike-cho, Abeno-ku, Osaka 545, JAPAN
Tel: (06) 621-1221 Cable: LABOMET OSAKA Telex: J63428 Attn: OSKPA (LABOMET A-D)

U.S.A.: SHARP ELECTRONICS CORPORATION
10 Sharp Plaza, Paramus, New Jersey 07652 Tel: (201) 265-5600
Electronic Components Dept.

EUROPE: SHARP ELECTRONICS (EUROPE) GMBH
Sonninstrasse 3, 2000 Hamburg 1, F.R. Germany Tel: (040) 23775—1
Electronic Components Dept.

SPECIAL REPORTS

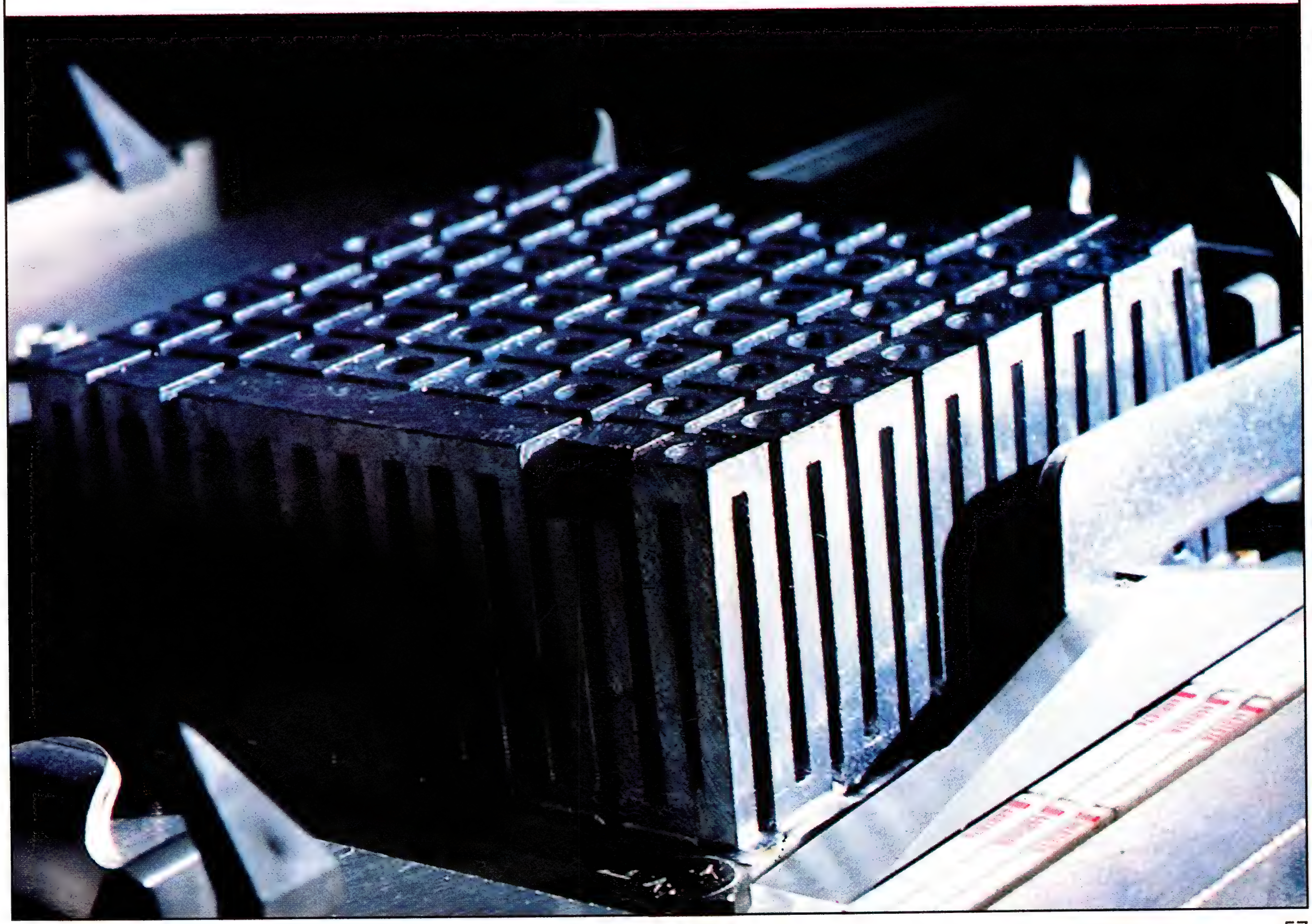
INFORMATION TECHNOLOGIES RACE TO MERGE

Developments in computers, data storage, and communications abound as forces gather momentum to drive these once-distinct technologies together

Information technology today involves very large-scale integrated circuits, advanced computer architectures, complex microprocessors, new ways to store data, digital communications and fiber optics, and the high-level integration of an increasing number of diverse systems. All these areas are increasingly interdependent: before long, it will be impossible to talk of one area in isolation.

For example, it is even now becoming difficult to discuss computer technology without mentioning device technology, communications chips, and networking. Although information technology is advancing in all areas, some of the most active innovation is happening in supercomputers, 32-bit microprocessors, data storage, communications, and systems integration.

Compact. The packaging of the central processor and memory of the IBM 4381 mainframe computer system on a single multilayer board exemplifies the state-of-the-art in dense packaging. Shown is detail of one of 22 ceramic modules, which houses up to 36 air-cooled ICs.



COMPUTERS

Computers of all categories increase in performance: fifth-generation machines and supercomputers hottest

Computer technology depends on and marches in step with developments in integrated-circuit technology. Architectural innovations take advantage of faster, less power-hungry logic circuits; denser memories; several varieties of application-specific ICs; and advanced microprocessors. Packaging technology keeps pace to squeeze out ever greater performance and phenomenal increases in reliability.

The appetite is always there for that extra million instructions per second of processing power, yet another megabyte of memory, and a few more tens or hundreds of megabytes of mass storage. "Give me speed, give me room" has been the user's cry ever since the beast was invented. Fortunately, electronics and computer engineers keep delivering. The pace continues without pause.

Developments in technology have been applied at all levels of the computer pyramid: from hand-held and personal computers at the bottom to those rare but important specimens at the top, the supercomputers. Personal computers are challenging minicomputers, while both are approaching mainframes in capacity and performance. Yet mainframes themselves keep growing: with add-on array processors, they are entering the realm of today's supercomputers.

However, the developers of supercomputers and of next-generation computers have their sights solidly set on great increases in computational power, information-processing power, and storage power over what today's supercomputers can boast. No category catches up with and tramples over the one ahead of it, because the pack accelerates in unison. Such a uniform advance should not come as a surprise, since they all have access to the same technologies.

Keeping arbitrary computer classifications up to date is difficult. What, for example, is a minicomputer? A supermicrocomputer? Or, for that matter, any combination of prefixes to the word "computer"? Perhaps it would be more realistic to refer to the continuum of computers by some numerical scale, if a uniform measure could be developed. Another classification is "low," "middle," and "high." Then, of course, the industry would soon be troubled by such variations as "high lows," "low middles," "middle highs," and "high highs." Humanity has a compulsion to name things. Old names die hard and new names are easy to coin. Developing the technology seems to be easier than labeling it.

SUPERCOMPUTER SCORE CARD

Computer make and model	Maximum theoretical speed (megaflops)
Cray-1 (original model)	160
Cray X-MP/48	1,600
Hitachi S-810/20	800
Hitachi S-810/10	310
Fujitsu FACOM VP-200	500
Fujitsu FACOM VP-100	250
NEC SX-2	1,300
NEC SX-1	570
CDC Cyber 205	800

At the high end—supercomputers, fifth-generation computers, and artificial intelligence—large research and development projects are attracting attention. For example, the Japanese Fifth Generation Computer System Project, begun in April 1982, spurred several similar projects and groups elsewhere. Countries in the European Economic Community have the Esprit project under way; the UK has started its Alvey project; and a research cooperative (Microelectronics & Computer Technology Corp.) was launched in the U.S. Meanwhile, the three largest computer companies in Western Europe—West Germany's Siemens, Bull of France, and ICL of the UK—have set up another research cooperative.

More competition now

Until recently, the supercomputer field has been monopolized by two U.S. companies—Cray Research Inc. and Control Data Corp., both of Minneapolis. Now, three of the biggest Japanese computer firms—Fujitsu, Hitachi, and NEC—are in the race, too. Another U.S. firm, Denelcor Inc., Aurora, Colo., has joined the supercomputer fray with what is so far the only commercial parallel-processing computer with a multiple instruction and data-stream architecture: the HEP H1000. And array processors are being tacked onto Japanese and U.S. mainframes to add the performance characteristics of supercomputers for vector computing.

As the Japanese companies ready their first models for the market and develop follow-ons, the U.S. supercomputer leaders are developing their next products. Cray has the first model of its new Cray-2 series ready for initial installation and continues to enhance the Cray-1 series; the latest model, the Cray X-MP/48, a four-processor system with about 10 times the performance of the original Cray-1, has just been introduced. ETA Systems Inc., a spin-off from CDC's supercomputer development group, is making progress developing its first machine, an eight-processor supercomputer with a targeted operating speed of 10 billion floating-point operations/s. Denelcor is well into the development of its HEP 2 model.

Several new supercomputers from Japan are in use there but are yet to be exported; for example, Tokyo University has a Hita-

One step at a time in AI

The words "artificial intelligence" have come to evoke the promise of a new technological generation. But in the marketplace, little more than promises have thus far been delivered. In this area of heady expectations and spotty accomplishments, one man who has delivered and prospered is Larry Harris.

The 37-year-old native of Saint Louis and president of Artificial Intelligence Corp., Waltham, Mass., has parlayed a low-key style and a concentration on a single idea—that human beings should interact with their machines pretty much as they interact with one another—into a formula for success. His persistence first bore fruit in 1980, with the introduction of Intellect, the first natural-language information-retrieval system. His company continues to market and develop enhancements of the Intellect product, which claims some 200 installations and runs on IBM Corp. mainframes.

Overall, not much has happened of late in AI, says Harris, because "it's hard going . . . an intricate field." He is looking forward to some advances in the upcoming year, probably in expert systems—advances such as customized applications that solve specific problems. Likely applications for these systems will be in the banking or insurance businesses. "There are more people who are now claiming they will have products that will be a marked improvement," he notes. But before it is assumed that these products will be of the spectacular variety, Harris cautions that it is unlikely they will be the "stuff about which novels are written".

However, there are miles to go, he observes. "When I say it's going to be a good exciting year, do I mean we're going to be close to any true AI type of system, complete with mimicking human thought and behavior? Forget it."

In Harris's view, work on real-world problems helps to solve the deeper puzzles for which AI holds promise. It is one of the reasons he is not overly concerned about the recent flight from universities into private business, a move he himself made at the end of the 1970s, when he left a Dartmouth College teaching post to work with AIC.

"I took a lot of heat for leaving," he observes. "People said, 'Why are you wasting your time doing crass commercial things?' " Before leaving Dartmouth, Harris spent a long time doing natural-language research. His work in the field extended back to his 1972 Cornell computer-science Ph.D. dissertation. He received his undergraduate degree, also in computer science, from Cornell.

To set the groundwork for major breakthroughs in artificial intelligence, Harris believes, there must be a significant advance in knowledge representation. "That's the key. If you talk to 10 people, I think you'd hear it 10 times."

AIC's most recent enhancements of Intellect let the system pick up terms from the data base and allow end users to define additional terms. The company has also embarked on a project to provide personal computers with Intellect and to link these machines with mainframes.

Others may be waiting dramatic advances. Harris, however, says he's happy with meaningful steps forward.

-Craig D. Rose

---

chi Ltd. S-810/20 supercomputer (as well as six Hitachi M-280H IAPs—a model that is being exported). The M-280H IAP (integrated array processor) is a large mainframe computer with an array processor. National Advanced Systems has just started offering its models of the M-280H IAP in the U.S. NEC Corp.'s largest mainframe, the ACOS System 1000, is designed with an IAP, too.

Speculating about future entrants into the supercomputer race, Yukihiko Karaki of Tokyo University's Computer Centre thinks that IBM Corp.'s experiments with the 4341 and array processors prefigure the development of a similar system built around the 3081K. He also believes that Sperry Corp. will build a similar system around its 1108.

Machines from the two original and three new Japanese traditional supercomputer companies and their raw MIPS performance are summarized in the table. Hitachi's S-810/20 is rated at a maximum theoretical speed of 800 megaflops for 64-bit operations. Peak measured speed for a very simple benchmark of repetitive add and multiply operations is 751 megaflops. Peak measured speed for partial differential equations is 687 megaflops. The S-810/10 supercomputer is rated at 310 megaflops. Karaki says that four Hitachi supercomputers are in operation—three within the company and the one at Tokyo University.

NEC, in Tokyo, will begin shipping its supercomputer next spring. The firm will make an SX-2 computer rated at 1,300 megaflops (1.3 gigaflops) and an SX-1 computer rated at 570 megaflops. The SX-2 will feature a parallel array of four pipelines of four processors each—a total of 16 processors. The SX-1 will have two pipelines for a total of eight processors.

Fujitsu Ltd.'s two models of supercomputers are the FACOM VP/100, rated at 250 megaflops, and the VP/200, rated at 500 megaflops. According to Fujitsu, it has shipped two VP/100s, one to Kyoto University this April and the other to Nagoya University this January. It has one machine in house.

Fujitsu's only other comment indicated that its supercomputers would have to be exported through an overseas manufacturer. However, U.S. industry observers expect that Amdahl Corp.—now primarily owned and controlled by Fujitsu—will begin to market the VP-100 and the VP-200 in the U.S. early next year.

Japan also has a national supercomputer project, a scientific demonstration system. Hiroshi Kashiwagi, head of the Electronics Computer Division of the government's Electrotechnical Laboratory (ETL), emphasizes that the country is not paying to develop general-purpose commercial supercomputers to compete with existing or future machines. It is devising the technology from which commercial firms can develop supercomputers.

Japan's goals

This 10-year project started in April 1981 with a total budget tentatively set at $95 million. It seeks to develop new chips for use in supercomputers, as well as parallel-processing architectures and software that together can reach speeds in the order of 10 gigaflops. Most of the work has been contracted out, though some is being performed at the laboratory. Most of the research so far has concentrated on nonsilicon technologies. The contract research group includes Fujitsu, Oki Electric Industry, NEC, Hitachi, Mitsubishi Electric, and Toshiba.

Gallium arsenide work is the most advanced. Next comes research on the high-electron-mobility transistor (HEMT), both at room and liquid-nitrogen temperatures. Although often operated at the latter, these transistors can be tested at room temperature.

Josephson-junction devices are being examined as well. If successful, they should make it possible to greatly shrink the size of supercomputers. Refrigeration for the devices, which must be tested and operated at liquid-nitrogen temperatures, is a problem. But this kind of work is not included in the project, although it is being performed at ETL, Fujitsu, NEC, and Hitachi.

Parallel-architecture research consists mainly of contract survey-type work, with small-scale experimental fabrication at ETL this year. More processors would be used in parallel than would be used in AI; languages, algorithms, and architecture must be studied. Especially important is the analysis of user code. For repetitive loops, the innermost one will be processed by parallel processors, but the question of what to do about the outer loop or loops remains.

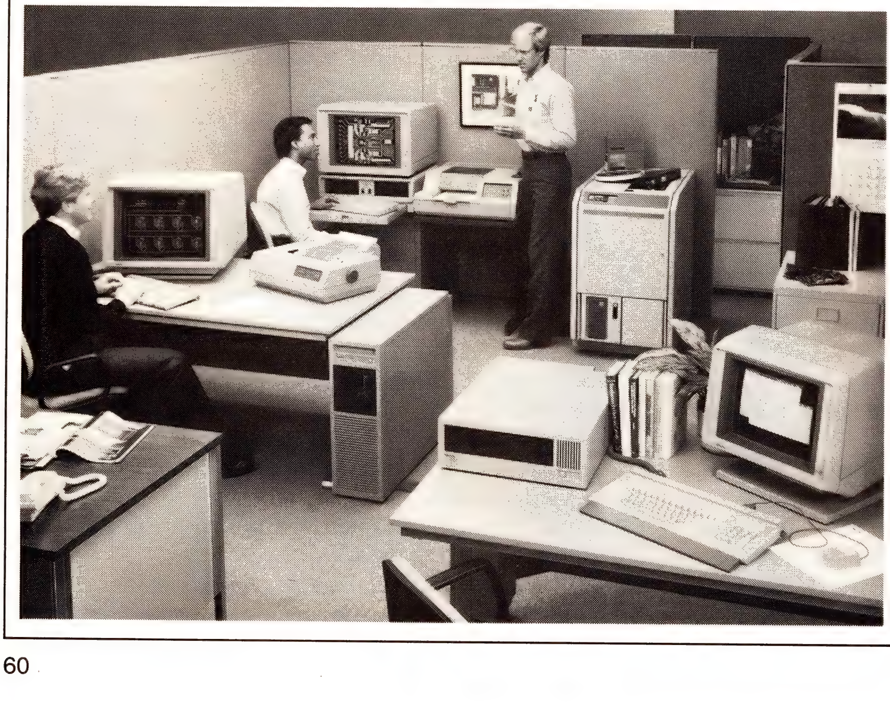
ETL is studying microprogram standards and looking for parallelism in user problems. One manufacturer is studying data-flow architectures, while another is looking for parallelism in high-level languages. **-Tom Manuel and Charles L. Cohen**

MICROPROCESSORS

New buses and 32-bit engines herald a new generation of powerful desktop computers

In the not too distant future, a mechanical designer using a desktop work station will be able to easily handle the large amounts of data required to perform finite-element modeling, and that will let computerized artists bring sophisticated animation to color graphics (see "Driving CAD/CAE/CAM with the Geometry Engine," p. 61). With the new generation of 32-bit microprocessors, these applications are just around the corner.

All the major semiconductor houses are in a race to outperform one another. They look at the millions of instructions/s that can be pumped through a processor as a crude but necessary yardstick to measure performance. Building on the success of its 16-bit 68000, Motorola Inc.'s Semiconductor Products Sector, Phoenix, Ariz., is introducing its 68020 chip, which will run at 16.67 MHz, bringing it up to 2.5 MIPS in a sustained mode and 8 MIPS in a burst mode. Zilog Inc.'s candidate for the 32-bit market, the Z80000, will see first silicon early next year. The Campbell, Calif., firm touts the chip's performance at 4.7 MIPS us-



Work stations. An example of products that advanced 32-bit microprocessors make possible is this 6000 family of intelligent graphics work stations from Tektronix Inc. These engineering work stations use the National Semiconductor 32000 microprocessor family.

ing several standard Unix calls in a nonoptimized mode. When the processor runs graphics applications, performance can climb to 12 MIPS during burst transfers.

National Semiconductor Corp., Santa Clara, Calif., which has licensed its product to Texas Instruments Inc., Dallas, is pumping 1.1 to 1.4 MIPS through its 32032 running at 10 MHz, but the part's real strength is its compatibility with AT&T Bell Laboratories' Unix operating system. Intel Corp., Santa Clara, will be releasing its 80386, the 32-bit successor to the popular 8086 family, later next year; it will be software-compatible with the 16-bit family. NEC Corp., Tokyo, started distributing samples of its V series of complementary-MOS 8- and 16-bit microprocessors in June, and work on a 32-bit processor is well under way.

Compatible systems

As the big houses rush next-generation microprocessors to market, they all remain committed to keeping software and operating systems compatible among the 16- and 32-bit machines, so as not to abandon the huge dollar investments and user bases associated with the earlier microprocessors. Movement will be upward as 16-bit software is ported to the 32-bit machines. Meanwhile, mainframe applications are going to work their way down to the desktop, where designers will be able perform simulation and modeling programs that formerly ran only on minicomputers or mainframes.

There is another class of 32-bit microprocessors—and one without a huge software base or millions of users. These chips will facilitate the creation of tightly coupled multiprocessor systems, so they can be used to build fault-tolerant systems for everything from private branch exchanges to transactional teller machines. They also can be configured to do the concurrent processing required of fifth-generation computers. Intel introduced its 80432, with the internal architecture needed to build fault-tolerant as well as Ada-based systems. The company calls the 432 a "technological vehicle to prove [it could build] fault-tolerant systems. It proves multiple processors can be added and subtracted from the system bus."

Another 32-bit chip designed for parallel processing—and one expected to have a greater application to fifth-generation computers, high-speed work stations, and real-time process controls than the Intel candidate—is the transputer from Inmos plc, Bristol, UK. It is designed in CMOS around a reduced instruction set that has been optimized for concurrent processing and a high-

Driving CAD/CAE/CAM with the Geometry Engine

Just as the microprocessor ushered in the era of low-cost computing, the Geometry Engine will usher in an age of low-cost geometric graphics, according to James H. Clark, 40, who designed the part. Although the analogy is not exact and the revolution cannot be expected to be as broad, his custom very large-scale integrated circuit brings high-quality real-time graphics to engineering work stations, without requiring expensive minicomputer or mainframe support.

Now that engineers are more expensive than the computers they use, speed and ease of interaction are imperative. In Clark's system, these requirements are met with speeds that are 100 times faster than those of comparably priced work stations to handle geometric data at rates of up to 100,000 coordinates/s.

Clark's route to developing the system and bringing it to market was mapped by his many propitious career changes. A high-school dropout, a Navy stint inspired him to continue his education. He pursued physics up to graduate school but changed course when he "decided that physics wasn't going to pay off." Moving into computer science, he became "broad in a graphics sense" at the University of Utah in Salt Lake City.

After trying various academic positions and consultancies, he went to Stanford University, Palo Alto, in 1979 as an associate professor and there encountered the pioneering VLSI work of Carver Mead and Lynn Conway, as well as the bit-mapped graphics of a project at the Xerox Palo Alto Research Center. That was when he "began to think about how to utilize VLSI so that it brought graphics into a modern age." Clark saw that engineering applications would require good three-dimensional interactive graphics rather than the typical two-dimensional page-imaging systems then available. "I came to the VLSI experience with a graphics background, and the Geometry Engine popped out."

The quantum leap he had to make was to disregard existing ICs—"forget that architecture, that kind of restraint." Clark likes to cite an argument made by Carver Mead: "In the limiting case, technology will allow us to put an entire system on a single integrated circuit. We will therefore either design that system ourselves or buy it from someone else." Clark became a systems engineer of the future and designed his own special-purpose IC in 1980. With Pentagon funding, it was put into a prototype system.

Although he realized the potential of his Geometry Engine, the inquiries he started receiving both from graphics companies and computer giants, told him one thing: "They didn't know what to do with the horsepower." Following a Stanford Business School plan for entrepreneurs, he gathered a few good men and began Silicon Graphics Inc., Mountain View, Calif., of which he is now chairman and chief technical officer.

Clark says that by putting his Geometry Computers and Terminals on the market, he stimulated demand for high-end graphics and forced others to adopt his approach. This July, the Special Interest Group on Computer Graphics of the Association for Computing Machinery gave him its Computer Graphics Achievement Award for developing the Geometry Engine. **-Eve Bennett** speed serial bus that makes attachment to other transputers or peripherals a relatively simple matter.

One major concern of designers working in this area is the insufficient effort being made by commercial vendors outside Japan to meet the challenges of fifth-generation computing. While they concede that universities in the West are doing research, they decry industry's complacency. Says one designer, "Look at the product plans: everyone wants to make a single-chip VAX" and is ignoring chips that can be tightly coupled for parallel processing.

New fleet of buses

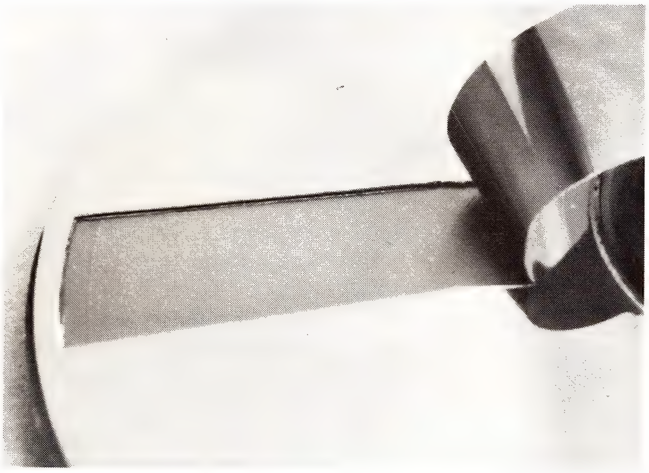
Keeping pace with the new microprocessors is a whole new generation of 32-bit buses designed to take full advantage of them. Dominating the market will be two buses touted for their open architectures: Multibus II—promoted by Intel; National Semiconductor; Advanced Micro Devices Inc., Sunnyvale, Calif.; and Zilog—and the VMEbus—championed by Motorola; Signetics Corp., Sunnyvale; and Mostek Corp., Carrollton, Texas. Both buses share such features as Eurocard form factors and multiple pathways for data. But where the VMEbus uses three pathways, Multibus II sports five buses. Both buses have full 32-bit primary data and addressing paths, and data-transfer rates are expected to run faster than 40 megabytes/s. But a basic difference is that Multibus II uses a synchronous timing scheme, while VMEbus runs asynchronously.

Nubus—which has had a number of champions over the years—is being used by TI in the Nu Machine, its entrant in the high-performance 32-bit computer contest. Like Multibus II, it uses multiplexed data and address paths, but its synchronous clocking scheme is based on a system clock that runs independently of the processors on the bus. The Nubus supports direct addressability of more than 4 gigabytes of memory through 32-bit addressing and data transactions of 8, 16, and 32 bits. Like its asynchronous variant, the Institute of Electrical and Electronics Engineers' Futurebus, it purports to be processor-independent and is attractive if multiple or special-purpose processors must be used. h**Robert Rosenberg**

DATA STORAGE

The old data storage frontiers crumble before new mass storage technology

As the computer speeds up and its applications penetrate every aspect of business and personal lives, the hunger for ever-denser data storage grows. From the home to the desktop to the corporate data center, demands are being placed on manufacturers of magnetic disk storage to pare away access time and to increase the densities of products by using exotic new materials and lower flying heights. Magnetic-tape technology is also about to shed its humdrum image and become a sexy item again as IBM embraces a new cartridge format. Also, optical-disk technology is about to make its long-awaited debut.


Flexible skin. A web-formed flexible skin stretched across a composite polymer substrate form the new stretch surface recording medium show by 3M Corp., St. Paul, Minn. It likely will find its largest applications in disks with 3 to 8 in. diameters.

All the major vendors of rigid magnetic disk-storage equipment are experimenting with thin-film heads and new particulate coatings and sputtering techniques for the medium. Perpendicular recording techniques—so called because flux transitions are oriented at right angles to the medium's plane—promise to reduce self-demagnitization and to make possible even higher densities, because the size of the magnetic cells can be reduced.

Some experts question whether perpendicular recording will fulfill its early promise. Comparisons between data from Hitachi Ltd., Tokyo, and Fujitsu Ltd., Kawasaki—which used a sputtered cobalt-chromium metallic film for perpendicular recording—and Ampex Corp., Redwood City, Calif., and NEC Corp., Tokyo—which are looking at longitudinal recording using plated cobalt-phosphorus and cobalt-nickel, respectively—seem to indicate that neither recording technique has an advantage over the other.

Coping with noise

The big challenge is to keep the noise generated by the magnetic head within acceptable limits as the flying height is dropped to accommodate the new recording materials. Extrapolating from existing data, the high coercive thin metallic film can probably produce densities as high as 45,000 bits/in. using the 14-μin. height of the top-of-the-line IBM 3380 disk. If the flying height can be reduced to 4 μin., the reward will be densities as high as 80,000 bits/in.

Increasing bit densities will not mean much unless heads can accurately track across the disk. Using techniques developed for optical disk drives, LaBudde Engineering Corp., Westlake Village, Calif., has demonstrated a tracking motor that can provide 3,000 tracks/in. on 14-in. rigid magnetic disk and 1,000 tracks/in. on removable media. A tiny tracking motor, with heads riding on top, mounts directly on a conventional positioning arm, which handles the long-stroke positioning while the tracking motor provides precision positioning.

Getting data off the magnetic disk faster than the 18-ms average access time currently achieved in the IBM 3380 generation will be a big challenge. A line of inquiry being pursued in the research labs of Memorex Corp., Santa Clara, Calif., a subsidiary of Burroughs Corp., is to slice seek time by ganging several thin-film heads on a slider, so that the only motion needed would be the distance between the transducers. If this approach proves workable, access times could sink to about 3 ms if multiple heads were used in conjunction with piezoelectric actuators dedicated to the surface of a disk.

Much of the technology being applied to rigid magnetic disks is spilling over onto floppies. Brown Disc Manufacturing Inc., Colorado Springs, Colo., and others are upgrading floppy disk technology by spin-coating 600-Oe particles onto a 5¼-in. form factor. Brown claims densities of 6 megabytes (unformatted) per disk, but most users will be getting only 1.6 megabytes when original-equipment manufacturers start announcing the new disk this fall. An exception: Drivetec Inc., San Jose, Calif., which is achieving 3.3 megabytes in its current product and may be up to 6.6 megabytes early next year because of refined head and control electronics.

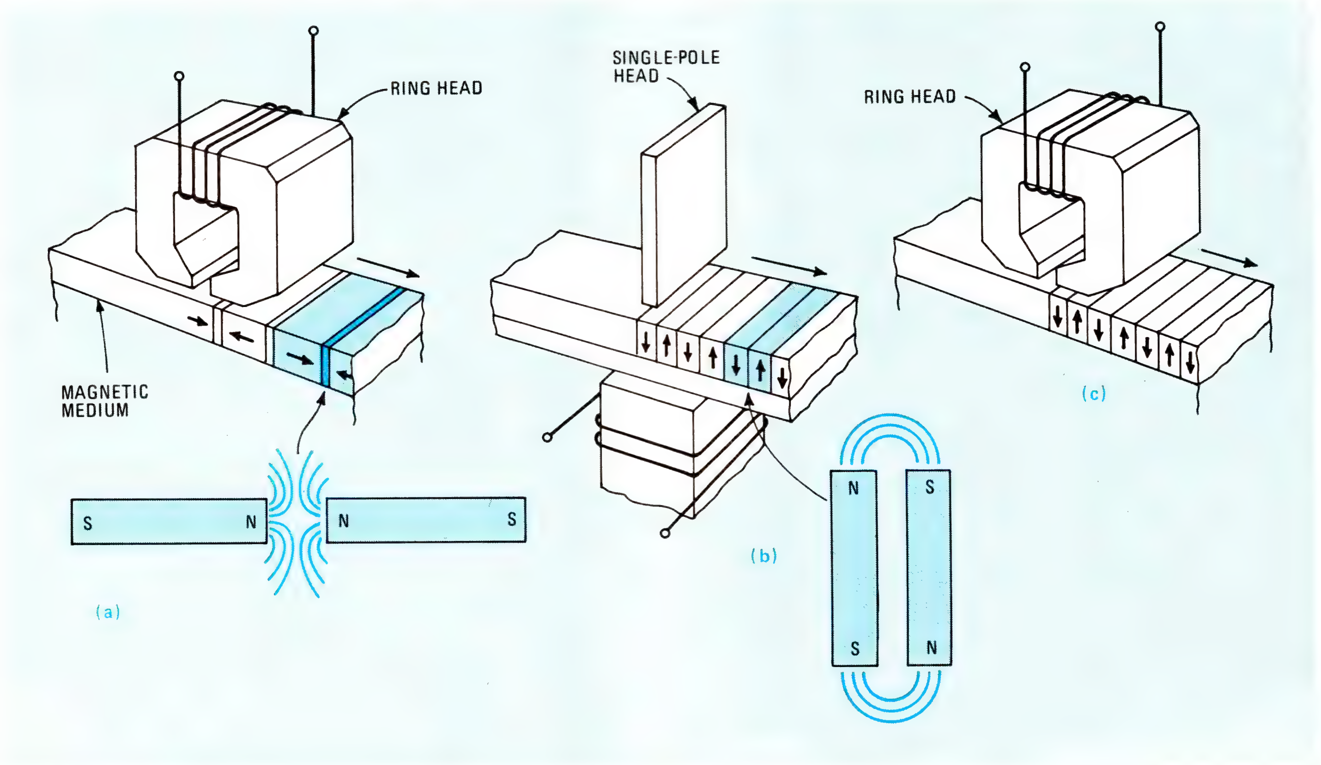
Others say the 5¼-in. form factor is an obstacle to manufacturing high-capacity drives. Because of very sloppy tolerances on the mechanical aspects of the drive, Vertimag Systems, Minneapolis, is abandoning work on a vertically recorded 3.4-megabyte-per-side diskette (unformatted) using sputtered cobalt-chromium on the 5¼-in. form factor. Instead, the company is going to a 3½-in. Sony-like disk. Full production, promised for mid-1984, is still a year away.

In the battle of the form factors, Sony and Hewlett-Packard Co. appear to have turned back the threat from the 3-in. disk promoted by Hitachi, Matsushita, and Maxell and to have routed Seagate Technology, Dysan, and Tabor, which favored the 3¼-in. form factor. More than 30 major media, disk, and computer manufacturers have lined up behind 3½-in. disks.

Stretching it

Some hybrid technologies on the horizon promise to combine the best features of floppy and rigid disks. In a challenge to Winchester technology, 3M Corp., St. Paul, Minn., is promoting its stretch-surface recording (SSR) medium, claiming that the web-formed flexible skins stretched across a composite polymer substrate could perform like a Winchester but would cost only about as much as a floppy. Small ridges at the outside and inside diameters of the injected molded substrate form the attachment points for the new proprietary polyester film, shown with a 600-Oersted ferrite coating similar to the coating used in 3M's 5¼-in. floppy. But the manufacturer claims that the substrate can be stretch-coated with any popular isotropic or metallic pigments, longitudinally oriented thin films, or perpendicularly oriented cobalt-chromium metals.

In the first new tape-drive design from IBM Corp.,



New life. Increased bit densities and longer recording life follow when horizontal recording (a) is replaced by perpendicular recording techniques (b). Experiments with both simple single pole head and ring head (c) are being evaluated for perpendicular recording.

since 1972, the 200-megabyte 3480 cartridge tape drive—dubbed the Del Oro—is built around a ½-in.-wide chromium oxide tape. The Armonk, N.Y., computer giant has achieved a density of 19-K/in. is achieved writing to 18 parallel tracks, but because the unit uses 24-K blocks, it will probably find its most appropriate applications when integrated with disks as the back-end of a mass-storage subsystem.

Optical disk ramping up

The next 12 months may be the year of the optical disk. Ready-only and write-once drives will probably start showing up in OEM quantities at the end of this year or the beginning of the next, and erasable optical disks are expected to appear in 1986. Designers and systems integrators who expect to replace magnetic storage with its optical equivalent will wind up missing the boat. What's needed instead is some thinking about how to integrate optical technology with magnetic storage in subsystems.

Some questions remain about how to organize, address, and index memory in hierarchical subsystems of memory so that entire libraries of archived data can be made amenable to on-line access. Wrestling with a whole new set of integration problems won't be easy, but the rewards will compensate. In the recently published *Optical Data Storage Outlook*, Raymond C. Freeman Jr., the disk-storage sage of Santa Barbara, Calif., predicts that the market will expand from virtually nothing in 1984 to $7.3 billion dollars by 1990. **-Robert Rosenberg**

COMMUNICATIONS

Fiber-optic, laser, IC advances will speed communications among coming multilingual office and factory equipment

Although they represent the new technology on the block, single-mode optical fibers with bandwidths stretching up into the gigahertz region are on the verge of overtaking traditional multimode fibers in high-capacity telecommunications applications (see "Moving light waves into the telecom mainstream," p. 67). One prominent example of the trend to single-mode technology was its selection for the first transatlantic light-wave link: AT&T Co. plans to run a single-mode cable from the New Jersey coast to the continental shelf, where the English and the French will each run a bundle from the cable to their own shores. Because of the maturation of the single-mode fiber industry, this past year has witnessed yet another round of distance and speed records.

Light triumphs

The blinding transmission rates of single- and multimode fibers will continue to overpower copper cable in long-haul communications. While the price of copper-based cable has steadily increased, fiber-cable prices have plunged. As a result, the long-awaited invasion of fiber optics into local communications will be taking place within the next few years even though transmission-rate requirements are small in comparison to the rates available with today's fiber technology.

Single-mode transmission cable will seldom be strung between local-network stations, at least in the foreseeable future. Along with the use of single-mode fiber comes the need for high-priced laser-based transmitters that can couple sufficient light into the fiber's small-diameter cores, as well as lower tolerances on coupler and connector losses. These factors have worked heavily in favor of both step- and graded-index multimode transmission in local nets. Still, multimode fiber can support transmission rates of hundreds of megabits a second, and the technology—though rapidly becoming passé in long-haul applications—will move on to conquer other frontiers: the lucrative markets for copper-cable replacement in local nets, feeders, local loops, and private lines.

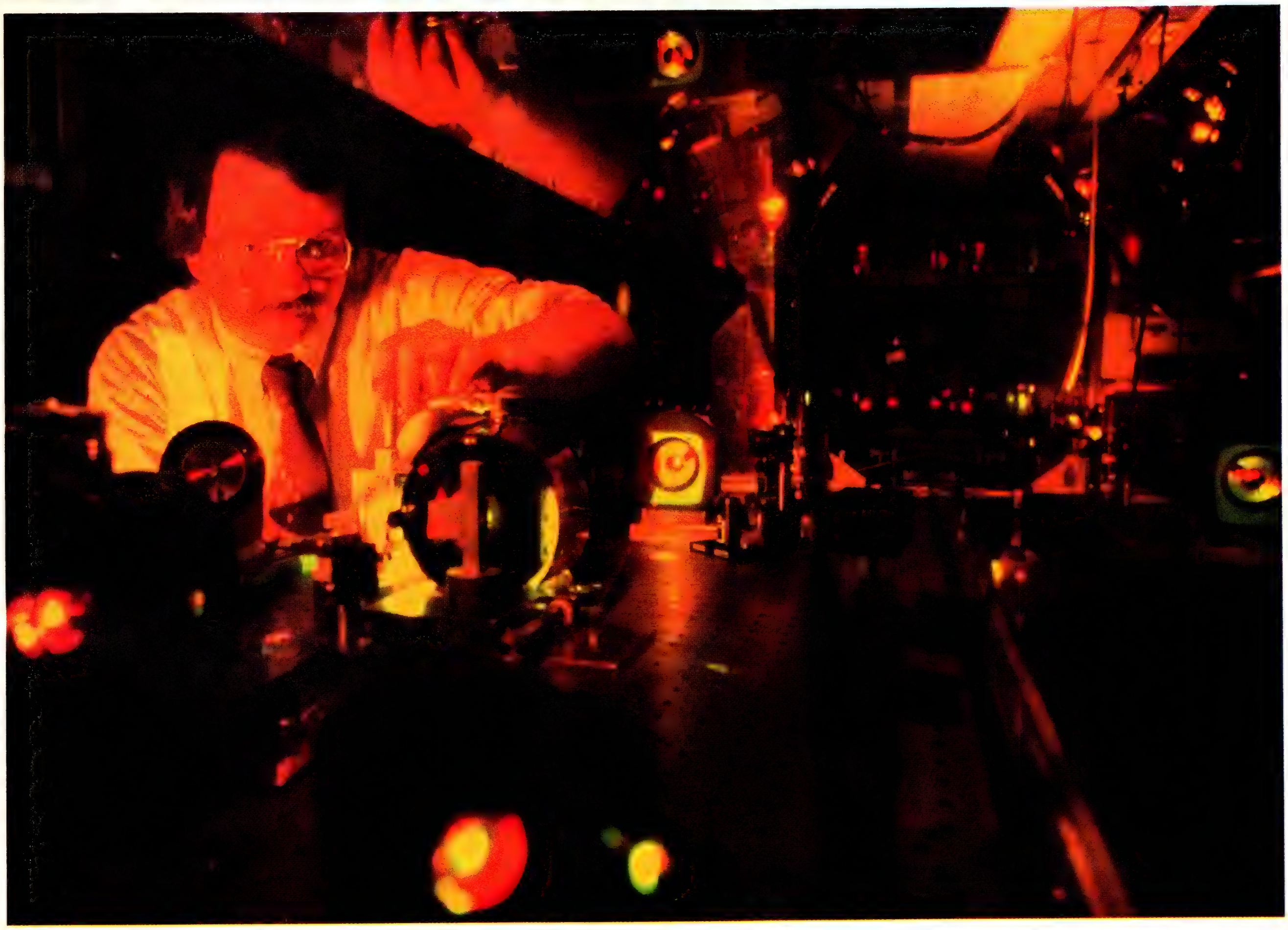
Although off-the-shelf fiber-optic systems have been limited by the use of direct modulation, laboratory work is heralding the day when a laser transmitter's phase and frequency can be modulated—and the resulting signal coherently detected. The capacity of such a communications system is stunning: an optical window from, say, 1.25 to 1.6 μm could carry a million video signals with wavelength-division multiplexing—the optical version of frequency-division multiplexing. Toward this long-range goal, a phase-shift-keyed homodyne receiver, using a bulky helium-neon laser, has been successfully demonstrated at British Telecom's Martlesham Research Laboratory, near Ipswich, Suffolk, UK.

Optical multiplexing

Multiplexing optical signals onto fibers is slowly coming off the laboratory workbench. The Martlesham lab has fabricated a 1.52-μm laser diode that is tunable to a bandwith as narrow as 10 MHz, while wavelength filters and lenses consisting of short lengths of large-diameter graded-index fibers have now been implemented in products that can multiplex up to four signals simultaneously.

Efforts to develop support components that can handle fiber's high data rate are indeed proceeding furiously, but satisfactory versions are in many cases years away. One bottleneck is the lack of compact, low-power optical switches. For example, Japan's Nippon Telegraph & Telephone Public Corp. has experimented with an optical switch that mechanically changes the coupling of an input fiber to one of two output fibers in response to 1-ms pulses—15 mA at 0.4 V.

The processing of electrical signals for transmission is making significant strides, too. Only a few years ago, implementing a modem design required dozens of components. Today, modem makers are using higher-density



Superfast. AT&T Bell Laboratories scientist Charles V. Shank adjusts an argon laser to create pulses as narrow as 30 fs. While today's solid-state laser devices produce light pulses with durations in the picoseconds range, the search for faster light sources continues.

integrated circuits—with on-chip digital signal processing—to lower part counts. More and more, functions once performed by dedicated ICs will be migrating to a single substrate. Even feature-rich modems will eventually land on one chip.

Some one-chip solutions for up to 1,200-b/s full-duplex operation are already here. Advanced Micro Devices Inc.'s 7910 and 7911 modem chips process digitized samples throughout the transmit and receive pipelines. By passing over the switched-capacitor filtering approach, commonly employed in single-chip modems, the Sunnyvale, Calif., firm reduced the number of processing steps required for fabrication. Depending on what modem type is called for, filtering attributes are accessed on demand.

Rockwell International Corp.'s Semiconductor Products Division, Newport Beach, Calif., makes a high-end card-level modem with two single-chip digital signal processors for 1,200-b/s full-duplex operation, including implementation of the Bell 212A standard. The signal processors can be reconfigured to handle the functions required of several modem standards, while a third chip takes care of the analog-to-digital and digital-to-analog conversion functions plus switched-capacitor filtering.

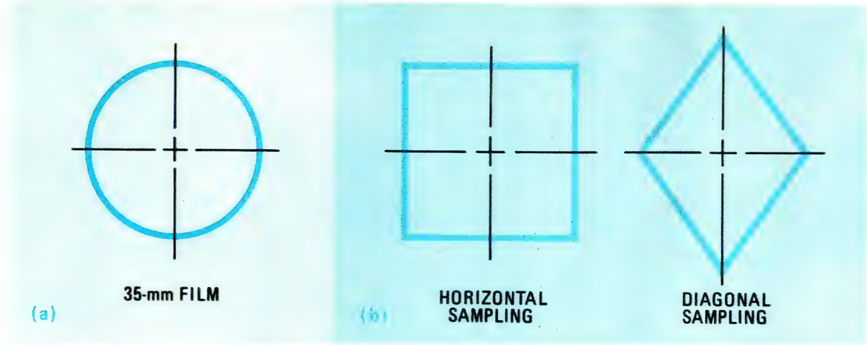
The public switched-network and dedicated lines are still the dominant market for modem chips. However, the expected upsurge in the local-network market will not go untapped. For example, Signetics Corp., in Sunnyvale, has just announced a 2-Mb/s FSK modem chip intended for 802.4 token-bus local networks.

Codecs, too, are heading for higher levels of integration. Siemens AG is readying a voice codec-filter combination that does its filtering in an on-chip digital signal processor. The Munich, West Germany, company chose this approach to make crosstalk lower than it is in codecs based on switched-capacitor filtering.

Single-chip video-compression codecs, which can reduce the hefty bandwidth required in video-conferencing, are still a very long way off. Widcom Inc., Campbell, Calif., has a system that can compress a video image down to 56 kb/s, though considerable high-speed processing must be performed. The codec occupies 16 in. of an equipment rack.

Chips on the roof

Receivers are also landing on single chips. For satellite earth stations mounted on roofs, the substrate material of choice is gallium arsenide, which provides the high-frequency amplification at low noise temperatures—a requirement in the reception of direct-broadcast-satellite channels. When and if DBS services get off the ground in a big way, single-chip GaAs receivers will likely be available. In France, Philips' Laboratoires d'Electronique et de Physique Appliqué is putting together an integrated preamplifier, a 10.8-MHz local oscillator, and a mixer. The prototype has a gain of 28 dB and a noise figure of 4.5 dB. Low-noise converters built with GaAs chip sets,



New angles. HDTV designers originally set out to surpass the polar distribution of film resolution (a). Horizontal sampling can do the job, but matching the eye's response to the resolution of diagonally sampled video (b) enhances the perceived resolution.

with overall noise figures down to 3.0 dB, will be coming into view in a year, and monolithic receivers with equal performance will follow.

With DBS also comes hope of breaking out of the traditional bandwidth limitations of conventional television. Thus research has intensified into high-definition TV service—a DBS byproduct that might have the most potential for stimulating consumer interest. Many people and institutions are working on HDTV; much work is yet to be done. One tiller in the vineyard is Japan's NHK Technical Research Laboratories, where engineers have succeeded in squeezing a 1,125-line signal—which, unmodified, requires 30 MHz of bandwidth—into an 8-MHz analog channel. However, the receiver must digitize and store the signal to reassemble the transmitted picture, and more than a megabyte of local memory is required for the process.

Product mix is important

With the benefit of hindsight, most experts now agree that debating the relative merits of topologies or access methods was less productive than coming up with a product mix that could cover a wide range of environments and provide a full set of software services. The high-bandwidth deterministic network architecture required for manufacturing process-control applications is very different from the requirements for file sharing among a cluster of personal computers in a small office—whose needs are also very different from those required for mainframe-to-mainframe communications.

As a result, local-net manufacturers will be nesting together networks of different topologies and capabilities by building bridges between nets. Prominent examples are the recent announcements by AT&T Information Systems, Morristown, N.J., and IBM Corp., both of which had been sleeping giants in low-cost local nets Both are proposing a new standard for an under-10-Mb/s network that can link personal computers inexpensively. The proposals are being evaluated by the IEEE 802.3 committee, which will issue its standard for carrier-sensing, multiple-access with collision detection networks in November.

PC Net, the network protocol IBM recently licensed from Sytek Inc., Mountain View, Calif., is a 2-Mb/s broadband network using standard 75-Ω coaxial cable, the same used for cable-TV transmission. It can thus transmit not only data but voice and video signals as well. AT&T Information Systems' 1-Mb/s StarLan proposal—which the company admits is not yet a "committed product"—links personal computers by means of simple twisted-pair wiring hung off a 1-meter bus centered in the telephone wire closet. The twisted pairs terminate at RS-422 line drivers and receivers in the closet. Both proposals are meant to be bridged to larger networks—Ethernet, in the case of baseband StarLan, and IBM's token bus and forthcoming token-ring network, in the case of PC Net.

In large measure, the market success of the Ethernet and other CSMA-CD nets based on the 802.3 standard was a consequence of Xerox Corp.'s investment in the higher-level protocols. Besides defining the physical- and data-link-layer requirements in Ethernet, the Stamford, Conn., firm continued moving up the seven-layer ladder and kept increasing the Xerox Network System's power, thereby providing network designers with the protocols they need to build applications. Testifying to the network's popularity are the seven firms pumping out Ethernet controllers.

Although the cost of building an 802.3 network is declining on a per node basis, the longstanding complaint has been that the high costs of cable and connectors have had a dampening effect on the network's proliferation. So StarLan is an attractive proposal where high bandwidth is not necessary. The Institute of Electrical and Electronics Engineers is also considering adding a specification for a less expensive version of Ethernet, dubbed Cheapernet, which runs at a full 10 Mb/s using RG58AU cable and BNC connectors. National Semiconductor Corp, Santa Clara, Calif., is already in production with a chip set that supports Cheapernet, betting that the low-cost cable-and-connection system will be part of the 802.3 standard.

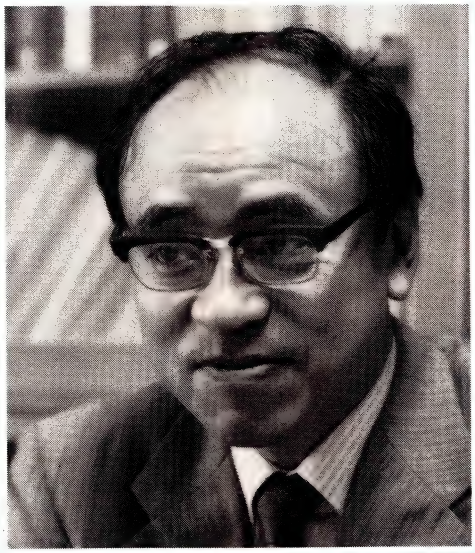
As a counterpoise to the nondeterministic nature of CSMA/CD, token passing on a bus (or IEEE 802.4) is of much interest to those concerned with data transfer between synchronous devices, such as in factory process control. IBM has endorsed 802.4 as one suitable approach for a general plant-floor local network using broadband coaxial cable. The firms now developing 802.4 nets are indeed looking to industrial applications as a bread-and-butter market for their products. For example, Ungermann-Bass Inc., Santa Clara, will be adding an 802.4-compatible product to its current line of broadband, baseband, and fiber-optic local networks, which now support Ethernet protocols using bridges to connect the various network types.

IBM's long-awaited token ring still lies in the future. When the company unveiled its prototype (using twisted-pair wires and baseband coaxial cable running at 4 Mb/s) analysts predicted that a full-blown network would be announced by the end of 1984. Thus far, none has materialized, though the IEEE's development of the protocol standards is moving ahead. A draft of the token-ring standard has returned from balloting, but fur-

Moving light waves into the telecom mainstream

The successful development of lasers to meet the very stringent requirements of future long-distance high-speed optical-fiber communications links is just part of the ongoing work being done by Yasuharu Suematsu at Tokyo Institute of Technology. His most significant achievement is the development of the dynamic single-mode laser, which unlike its predecessors continues to operate in a single mode even when modulated at hundreds or even thousands of megahertz.

Lasers operating in the 1.5-μm wavelength band must work in a single mode because the chromatic dispersion of low-loss fibers is large. In the future, the 1.5-μm band is bound to be used in preference to the currently popular 1.3-μm band, which has low chromatic dispersion, because attenuation is cut in half when using the 1.5-m band.



Dynamic single-mode lasers using distributed Bragg reflectors were developed in Suematsu's lab in 1980. Those students who worked on them have gone on to develop similar distributed-feedback lasers for Nippon Telegraph & Telephone Public Corp. Another former student is doing comparable work for NEC Corp.

In distributed feedback lasers current passes through the Bragg gratings, but in distributed Bragg reflector lasers, the active portion of the laser is separated from the frequency determining portion. This type of laser was used in recent NTT experiments in which a 400-Mb/s signal was transmitted 130 km without a repeater, and a 1.6-gigabit/s signal was transmitted 40 km without a repeater in the 1.5-μm band. Other recent developments by Suematsu's former students include a laser with surface rather than longitudinal radiation and a semiconductor laser operating in the 0.68-μm visible region.

Since 1960, at the start of the laser era, Suematsu's research has been all optical. He pioneered the use of gallium indium arsenide phosphide for 1.3- and 1.5-μm wavelength lasers, including crystal growth. Initial work was done with Fabry-Perot resonators, later efforts with distributed Bragg reflectors. His early research is especially notable because it was done on a low budget; now that his work has come into the mainstream, more funding is available.

Suematsu has done other experimental and theoretical work on semiconductor lasers, including modulation characteristics and maximum frequency of modulation, as well as suppression of transverse modes. He is also working on optical integrated circuits, originally with glass waveguides and now with integral ones. Earlier, he investigated optical transmission media, such as dielectric and gas lenses, and he continues to work on fibers.

In October 1983, Suematsu was awarded the Valdemr Paulsens (the inventor of magnetic recording) gold medal from the Danish Academy of Technical Science. Given only once every several years, this medal recognizes exceptional achievement in wireless telecommunications and magnetic recording. **-Charles L. Cohen**

ther work was mandated. Unlike other 802 standards, the 802.5 bit order during transmission puts the most significant bit first.

At the global level, work aimed at open systems interconnection will allow practically any processor to be interfaced to any other one, anywhere. The goal of universal interfacing, which the International Organization for Standardization is pursuing relentlessly, is making real progress, and the pace is expected to quicken in the years ahead. ISO has had its most striking successes in the specification of standards for the lower rungs on the seven-rung local-net OSI ladder: the physical, data-link, network, and transport layers.

A dramatic demonstration of the progress of open systems interconnection at this year's National Computer Conference, in Las Vegas, showed that equipment from different vendors can be made to operate in unison using standard protocols. In one demonstration, organized under the auspices of Boeing Computer Services Co., a division of the Seattle, Wash., aircraft maker, multivendor products were tied together on an IEEE 802.3 CSMA/CD network using a transport standard approved by the ISO.

In another demonstration, General Motors Corp., New York, showed how the same transport protocols were used to link heterogeneous processors from several manufacturers on an IEEE 802.4 token-passing bus network. The exhibition proved to manufacturers that standards at the lower levels of the OSI model are well enough along to encourage investment to bring products into compliance with the standards.

Work is currently under way at several large IC houses to design IEEE-standard chips for the message-handling and error-detection protocols defined in the transport layer. AMD is examining what features and interfaces customers would be willing to pay for, and Motorola Corp.'s Semiconductor Products Sector, Phoenix, Ariz., is at work on a transport level chip, so limited production quantities of the chip should be ready in 1985.

The NCC demonstration also heralded the start of a drive to standardize the higher-level protocols. ISO, along with the International Telegraph and Telephone Consultative Committee, will likely put into final form a set of protocols for message handling before the end of the year. **-Terry Feldt and Robert Rosenberg**

"You can count on Philips Counters...
PM 6673 universal frequency counter 120MHz
PHILIPS
300.026989
PM 6675 universal frequency counter 600MHz
600.000000
PM 6676 universal frequency counter 1.5GHz
1500.00000
PM 6667 high resolution counter 120MHz
33.33333
PM 6668 high resolution counter 1GHz
1000.000
SENSITIVITY
MEASURING TIME

...because for me, performance and programm

- Philips' wide range of high-technology frequency counters and timer/counters give you more choice, more measuring power and more value for your money.

From our low-cost frequency counters, right up to the highest-performance 1.5 GHz/2 ns fully programmable timer/counter that covers every need in frequency and time measurements.

All models feature state-of-the-art microcomputer-based design. With reciprocal frequency counting, for ease of use and the highest possible resolution, ±1 input-cycle errors have been eliminated for good.

Even low frequencies are measured with at least 7 digits resolution in a second, while the high-performance PM 6654 gives you 9 digits/s.

There is a choice of different crystal oscillators up to 5×10^{-10}/24 h and many other options including battery operation, IEEE-488 Bus control, BCD and analog output.

- When frequency counting has to be accurate, count on Philips. From our low-cost 10 Hz-120 MHz model PM 6667 with automatic triggering, up to our most sophisticated 1.5 GHz high-resolution frequency counter. Each one gives you reliable measuring results, time and time again.

Philips offers the best frequency counter front-end circuitry available, with high noise immunity to insure error-free triggering.

High accuracy is further insured by 5×10^{-10}/24 h high-stability crystal oscillators that can be kept stable under any conditions with the optional built-in battery back-up,

PHILIPS **Test & Measuring Instruments**

Philips' PM 6654...the timer/counter that's 100%-programmable and more affordable!

"First, it is 100%-programmable. One micro-computer automates the front panel controls, another speeds up measurements and data-handling.

It makes Voltage measurements: V_{max}, V_{min}, V_{dc}, V_{pp} or even V_{rms} whether on LF sinewaves or high speed pulses.

In combination with the time measurements: DUTY FACTOR, PERIOD, PULSE WIDTH, RISE-AND-FALL TIME, these new PULSE-VOLTAGE measurements allow an automatic test system to measure pulse- and other input parameters, that previously only could be viewed on an oscilloscope.

Speed? It reads up to over 400 measurements/s. Its 2ns real-time clock gives higher resolution and speed than others."

bility count just as much as quality and price."

enough for over 20 hours of line voltage-independent stabilization.

But best of all, whatever your needs are, you know you can count on Philips every time!

● With Philips compact timer/counters, HIGH TECHNOLOGY is no idle claim. As you'd expect, we offer state-of-the-art design, with a custom counter-on-a-chip LSI, for maximum reliability and value for your money.

Even more important, they also give you unbeatable measuring features and accuracy.

High-resolution frequency counting, period and time-interval measurements are supplemented by valuable extra facilities like: PHASE, BURST and RPM.

For automatic testing, IEEE-488 Bus versions are available with all major functions remotely programmable.

Best of all, HIGH TECHNOLOGY means more benefits for you. These timer/counters offer more measuring capabilities than any others in this category. And at a price that surprises competitors!

For full details call 800-631-7172 except Hawaii, Alaska and New Jersey.
In New Jersey call collect (201) 529-3800 or write to Philips Test and Measuring Instruments,
85 McKee Drive,
Mahwah, NJ 07430."

PHILIPS

Circle 69 on reader service card

Telecommunications Engineers

The Engineering Muscle And The Technical Talent To Lead A Telecommunications Revolution... Right Here With Hayes In Atlanta.

We've built a powerful engineering and technical team here at Hayes. It's been our strength and the reason for our success from the very beginning. Our focus has been on recruiting and developing the talent it takes to do more than merely compete, but to lead. The result has been a success story few in the industry can equal.

For those of you who have searched far and wide for just such an environment, where talent is provided the freedom and encouragement to grow, then perhaps it's time to take a good, hard look at Hayes in Atlanta. There's a future in it.

- HARDWARE/MICROPROCESSOR DESIGN ENGINEERS
- SOFTWARE DEVELOPMENT PROGRAMMERS/ANALYSTS
- VLSI/DSP DEVELOPMENT ENGINEERS
- PRODUCT ENGINEERS

Interested, qualified candidates should forward a confidential resume to: **Hayes Microcomputer Products, Inc., Dept. TJC-84, 5923 Peachtree Industrial Blvd., Norcross, GA 30092.** An Equal Opportunity Employer, M/F.

Opportunity for the here and now.

Hayes®

Hayes Microcomputer Products, Inc.

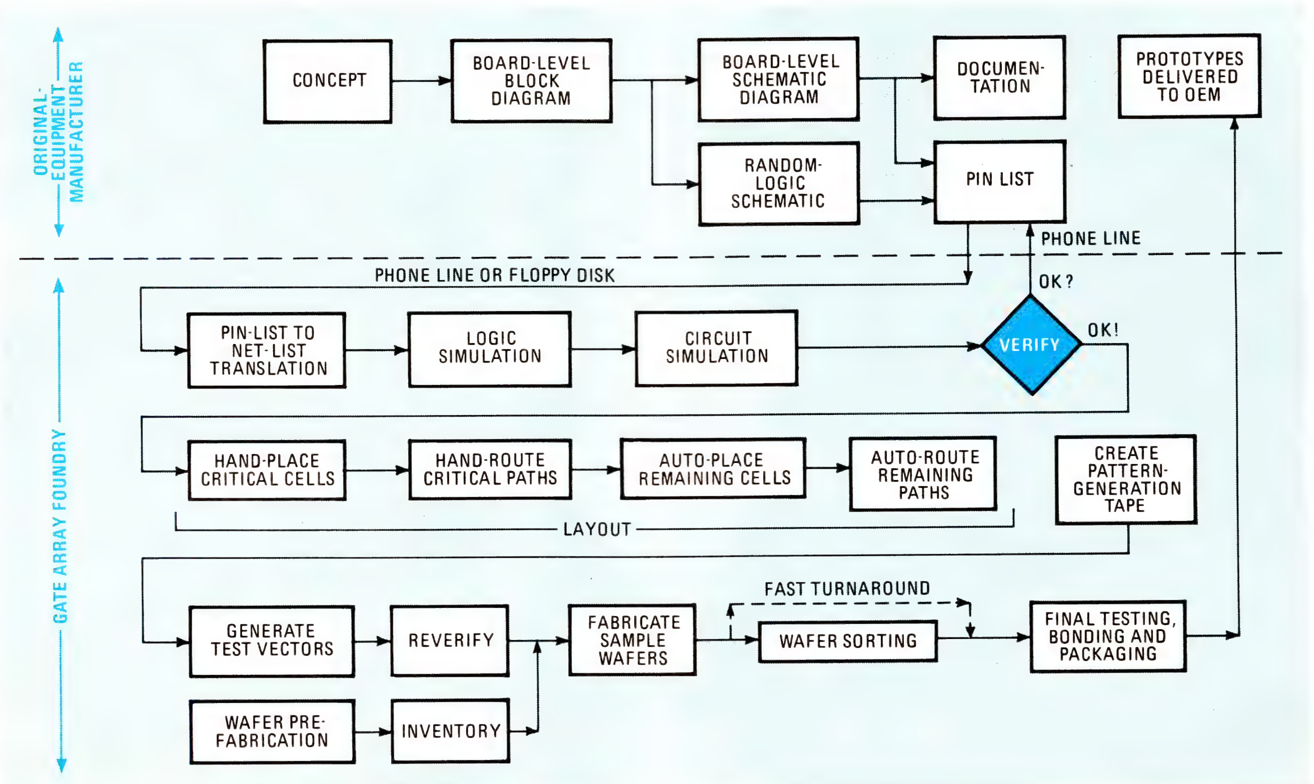
ROLE OF OEM IN ARRAY DESIGN STARTS WITH XT

Gate-array design at original-equipment manufacturer starts on Personal Computer XT, with supermini at silicon foundry massaging net list

☐ *by Bruce Gladstone and George A. Stephan*

Traditional approaches to gate-array design involving multimillion-dollar mainframes and such specialized tools as automated-placement-and-routing software, logic simulation, circuit characterization, and test-vector generation are not cost-effective unless a large number of designs are required. Recently, lower-priced work stations have been introduced to provide some of those tools on a more local level. But even at $75,000 to $100,000, trying to amortize capital outlay over the few designs a designer might require may still prove to be less than cost-effective. These problems are minimized—with the bonus of faster turnaround times—for the original-equipment manufacturer who has on-site access to the gate-array vendor's in-house sophisticated processes.

A time-sharing service linking a gate-array foundry's mainframes to an OEM designer's personal computer has been created by FutureNet Corp. and Universal Semiconductor Inc. Called Unicad-1, this approach to gate-array design and production allows the circuit designer to use a $15,000 XT-configured model of the IBM Corp. Personal Computer to generate a logic design of the target product in the sequence shown in Fig. 1. The XT can then translate the designer's graphic format, a schematic diagram with a pin list, into the foundry's mask-making


ORIGINAL-EQUIPMENT-MANUFACTURER
CONCEPT
BOARD-LEVEL BLOCK DIAGRAM
BOARD-LEVEL SCHEMATIC DIAGRAM
DOCUMENTATION
PROTOTYPES DELIVERED TO OEM
RANDOM-LOGIC SCHEMATIC
PIN LIST
PHONE LINE
PHONE LINE OR FLOPPY DISK
OK ?
GATE ARRAY FOUNDRY
PIN-LIST TO NET-LIST TRANSLATION
LOGIC SIMULATION
CIRCUIT SIMULATION
VERIFY
OK!
HAND-PLACE CRITICAL CELLS
HAND-ROUTE CRITICAL PATHS
AUTO-PLACE REMAINING CELLS
AUTO-ROUTE REMAINING PATHS
CREATE PATTERN-GENERATION TAPE
LAYOUT
FAST TURNAROUND
GENERATE TEST VECTORS
REVERIFY
FABRICATE SAMPLE WAFERS
WAFER SORTING
FINAL TESTING, BONDING AND PACKAGING
WAFER PRE-FABRICATION
INVENTORY

1. Mixing skills. By capturing schematic logic designs at the front end, the Unicad-1 gate-array design system can bring $2 million computer-aided design facilities to original-equipment manufacturers at the price of a fully configured IBM Personal Computer XT—about $15,000.

The case for gate arrays

The typical crush for prototype delivery is a commonplace to anyone involved in the design and manufacture of products intended for such applications as the personal-computer aftermarket. Marketing strategies that often hinge on minimizing the time delay between the initial market perception and the finished product, unscheduled changes in host systems because of upstream changes in peripherals or the way they are controlled or interfaced—these and other factors impose familiar burdens on the original-equipment designer, who must suddenly accommodate these changes. Equally familiar is the big bill that follows them.

Consequently, suppliers of products for the personal-computer aftermarket and similar applications often wind up using programmable logic arrays, field-programmable-logic arrays, and other designer-programmed devices in designing their products. That's often the wrong solution. The use of gate arrays instead can substantially reduce the area and cost of printed-circuit boards. For volumes above 1,000 to 2,000 parts per month, gate-array circuits are generally less expensive to use than medium-scale integrated circuits. Gate arrays can free up board space by one third or more, providing more functionality per square inch and therefore more powerful products per card slot.

Gate arrays are cost-effective in replacing low-power Schottky parts, since 10 to 30 chips can be reduced to one gate array, sidestepping the real-estate limitations of circuit cards for personal computers. Three PLAs, each equivalent to four TTL parts, can be integrated into a lower-cost gate array, with the side benefits of higher mean-time between failures, fewer inventory parts, and simpler, cheaper pc boards. Compared with PLAs and FPLAs, gate arrays provide more design flexibility: each PLA and FPLA is limited to a single clock input, whereas gate arrays can accommodate multiple clocks.

format, or net list. The net list is loaded into an in-house VAX-11/780 or -11/750 from Digital Equipment Corp., where it is massaged by the specialized design tools on the mainframe. Resultant test vectors toggle all circuit nodes, and all combinations and permutations of analog test parameters are executed. The only compromise with this method is that specific combinations of test word sequences might be abbreviated by 3% or so, according to machine-load scheduling.

This approach is well suited to designing low-complexity gate arrays, where 200 to 2,400 gates are required. Functionally, this includes controller subsystems for computer peripherals, finite-state machines, industrial process and building controllers, and special-purpose arithmetic functions such as multipliers, small array processors, and fast Fourier transforms. The performance of reiterative software routines can usually be increased significantly by integrating them in dedicated hardware made with this type of gate array.

After a circuit schematic for the target product is developed from the designer's sketch of a logical block diagram, it is rapidly converted to a detailed schematic diagram and pin list, using the IBM PC as a high-level drafting station (Fig. 2).

Chip catalog

Functional parts symbols are called up to the XT screen from a data base resident on a floppy disk drive. The data base contains an up-to-date catalog of over 85% of all commonly used small-, medium-, and very large-scale integrated circuits, from hex inverters to microprocessors. It takes less than a second to call up a chip, and moving or replicating any component or group of components requires 2 seconds or less.

Perhaps the most significant feature of the front-end schematic-capture process is the station's fast screen response, a result of the unusual manner in which display data is organized in the XT's random-access memory. Unicad's display data is spatially organized, with everything laid out in the sequence in which it needs to be displayed, rather than in logically organized lookup tables that refer symbols, wire nodes, alphanumerics, and other elements to frame coordinates. This technique somewhat complicates the software behind the display, but pays off in throughput and response time.

Unicad is four to five times faster than other schematic capture systems now on the market. An updated schematic appears immediately after releasing the return key, without discernible delay. The structured, interactive design system (Strides) provides a unified "drawing tree" that changes all interrelated circuit segments simultaneously and automatically when lower-level elements are modified. This feature creates a completely interrelated data base of nested schematics, from block diagrams at the uppermost level down to the component parts. Any change at a lower level is reflected throughout all upper levels, updating drawings to eliminate oversights and errors. There are no limits to the number of levels in which Strides can operate.

Logic simulation

When the logic design and schematic diagrams for the OEM's target product are complete and documented, the next step is to send the data to the foundry's VAX computer. This is done with a 1,200-baud modem and communications software supplied with the IBM PC terminal. The subscribing OEM is issued a unique password that provides unrestricted access to the VAX and the software simulations. Once the VAX acknowledges the password, it presents a billboard describing the various simulation techniques available.

The next step is to transmit the target pin listing to the VAX system for capture on hard disk and conversion to a net-listing format suitable for both Applicon and VAX equipment. Then the VAX computer performs a 100%-logic simulation, using a 12-state simulation package designed for complementary-MOS parts that includes fault simulation, test-vector generation, and bidirectional transmission gate test capabilities. In the simulation, random-logic macrocells are modeled to represent the device's propagation, rise and fall times, and fan-out characteristics. The outputs of this simulation are binary patterns and pseudo timing diagrams. During this simulation phase, some areas of the circuit can be physically simulated, with results given as voltage levels plotted against a time base.

When the simulations are completed, the binary pattern outputs are transmitted back to the user with the 1,200-baud modem and recorded on disk by the XT.

If the logic conforms to the OEM's expectations, the circuit is approved and released for further processing. If the simulations reveal any design flaws, or if the OEM requires additional modifications, a revised circuit is generated and captured on the XT, and a new pin listing is sent to the foundry for a second iteration.

Cell layout

Depending on the complexity of the OEM's random logic and the percentage of the gate array utilized, the layout is usually produced with a combination of interactive and fully automatic techniques. One typical sequence might involve manually placing key macrocells and interconnecting the most critical paths, then automatically placing and interconnecting most of the remaining macrocells and, finally, manually placing and interconnecting the remaining unembedded elements.

Since auto-place-and-route software is driven by the net list, which at this point has been simulated and verified, it is theoretically impossible to introduce any errors into the circuit during layout. As an extra security measure, however, three checks are run after the layout has been completed: a design-rule check ensures that no physical rules—for example, intermetal spacings or contact coverages—have been violated; an electrical-rule check ensures that there are no electrical-rule violations, such as V_{DD}-to-V_{SS} shorts or floating contacts; and a 100%-logic check ensures that the gate array's layout conforms to the simulated net list.

Turnaround time required to complete a fully verified gate-array layout depends on the size of the array and the percentage of the circuit utilized. An 80%-utilized 1,000-gate array would typically be laid out and verified within five to seven days.

As soon as the layout and interconnection phase has been completed, the gate-array project moves into its production phase. The pattern-generation tapes produced directly from the simulated and verified net lists are generated on the VAX mainframes and then used to create chrome-glass shadow masks that form the interconnection pattern for the gate array's macrocells. When completed, the magnetic pattern-generation tapes are released to the foundry's mask-making facilities; there they will control the more than 1 million high-resolution xenon lamp flashes used to define the patterns on the shadow-masks that form the interconnection pattern for the gate array's macrocells. Usually, the tooling that is necessary to prepare the contact and metal-interconnection masks for a specific application can be produced, inspected, and released within three to five days.

Once the interconnection masks are produced, the logic-integration process advances to the wafer fabrication stage, where the OEM designer and Universal Semiconductor's applications team select one of 18 different types of wafers. Universal Semiconductor's family of gate-array wafers is matrixed according to two specifications: size—up to 2,400 gates—and performance, with features that include sizes down to 2 µm, toggle rates of up to 40 MHz, and propagation delays for single inverters down to 700 ps.

PIN LIST

U21 (NOMENCLATURE)
7400 (TYPE OF DEVICE)
NODE
SIGNAL NAME
pin #1 → Input 1
pin #2 → Input 2
pin #3 → Output 1
pin #4 → Input 3
.
.
.

NET LIST

Input 1 → (U21 pin 1) + (U24 pin 4) + (U27 pin 2) · · ·
Input 2 → (U21 pin 2) + (U15 pin 3) + (U17 pin 9) · · ·
Input 3 → (U21 pin 4) + (U7 pin 37) + (U18 pin 4) · · ·

2. Many references. Pin lists are referenced to component device nomenclatures, type numbers, pinouts, and pinout routes. Net lists are used by foundry computer-aided design software to generate interconnection masks by routing each signal name to its required nodes.

After the appropriate wafer is withdrawn from inventory, the source and drain contacts are opened, the wafer is metallized, the metal-silicon interface is alloyed for high-quality ohmic contact, glass passivation is added, and bonding pads are opened. Because 85% of the gate-array wafer has already been manufactured prior to the personalization steps, the fabrication process is brief. New gate-array designs are processed through these personalization steps in two or three days, maximum.

Final phase

The final phases of gate-array design include prototype packaging and testing. The first testing step involves probing the wafer's process-control monitors. These devices, located at five strategic sites on the wafer surface, contain circuitry used to validate the electrical properties of the wafer and to verify that the basic parameters of the 2-, 3-, or 5-µm silicon-gate CMOS technologies are within specifications.

Final test programs include vectors that toggle all circuit nodes and execute all combinations and permutations of analog test parameters. After final testing, 10 packaged and fully tested engineering samples are delivered to the OEM for his evaluation. Total elapsed time between the approval of the net list and OEM receipt of packaged and tested parts ranges between four and eight weeks, depending on the size and complexity of the array. Production quantities are routinely delivered within five weeks after prototype acceptance. ☐

Bruce Gladstone is the president of FutureNet Corp., Canoga Park, Calif., and George A. Stephan is president of Universal Semiconductor Inc., San Jose, Calif.

THOMSON SEMICONDUCTORS

REVOLUTION

The writing is on the wall, things are changing...
High power triacs and SCR's are moving towards new packaging solutions. Thomson Semiconductors innovates yet again with a new generation of SCR's and triacs in the cost effective TOP 3 case outline. High power, 1200V, 40 A in a highly reliable isolated tab package is no longer a myth.

- *Safe: The TOP 3 features 2500V tab isolation.*
- *Reliable: The TOP 3 can withstand more than 10000 thermal cycles.*
- *Practical: The TOP 3 is easy to assemble with a mounting clip.*
- *Economical: The TOP 3 replaces outdated packages and considerably reduces assembly costs.*

Thomson Semiconductors is dedicated to technological and economic advancement. Share the revolution with us.

THOMSON
COMPONENTS
SEMICONDUCTORS

France
PARIS VÉLIZY
Tel. (3) 946.97.19
PARIS COURBEVOIE
Tel. (1) 788.50.01

Austria
WIEN
Tel. (222) 94 62 82

Bénélux
BRUXELLES
Tél. (2) 648.64.85

Brazil
SAO PAULO
Tel. (55 11) 542 47 42

Canada
OTTAWA
Tel. (613) 236 36 28

A NEW HORIZON

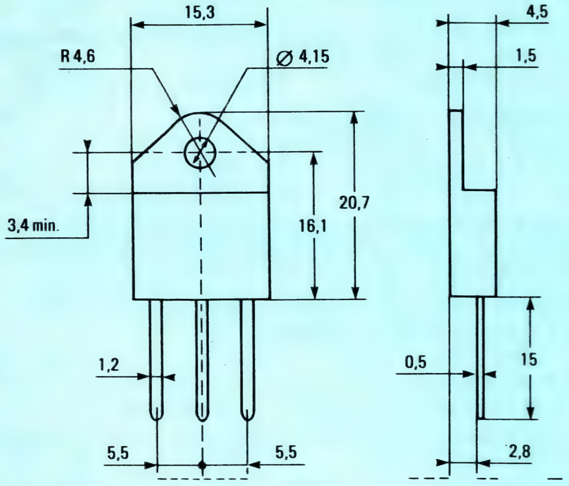
THYRISTORS
TRIACS - ALTERNISTORS

2500 V ISOLATION

The new generation of high power SCR's, triacs and alternistors in TOP 3 case feature isolated tab construction offering an isolation surge voltage in excess of 2500 Vrms (UL recognition pending). This standard feature offers considerable design advantages for equipment destined for use in consumer applications.

A COMPLETE NEW GENERATION OF DEVICES

Device	*Part number* *isolated tab*	 *non isolated tab*	$I_{T(RMS)}$	V_{DRM}
SCR	*BTW 68* *BTW 69*	*BTW 68.. N* *BTW 69.. N*	*25 A* *40 A*	*up to 1200 Volts*
TRIAC	*BTA 26* *BTA 41*	*BTB 26* *BTB 41*	*25 A* *40 A*	*up to 700 Volts*
ALTERNISTOR	*TPDV.. 25* *TPDV.. 40*		*25 A* *40 A*	*up to 1200 Volts*



TOP 3 : Case outline

HIGH RELIABILITY

Extensive thermal cycling tests have proved the sustained reliability beyond 10 000 cycles of the TOP 3 isolated tab construction. The excellent thermal impedance and high reliability make the Thomson Semiconductors' TOP 3 triacs and thyristors well adapted to demanding applications such as welding supplies and heating control where thermal cycling is severe.

APPLICATIONS

SCR's :

The BTW 68 and 69 series of SCR's offer a revolutionary innovation by integrating isolated tab construction as a standard feature. Compared to traditional metal stud devices (TO 48) this new construction offers considerable cost saving and ease of assembly, leading to considerable design improvements in battery charger, welding, motor control and crowbar protection application areas.

Triacs :

The BTA/BTB 26 and BTA/BTB 41 triacs in TOP 3 case correspond to a natural continuation of Thomson Semiconductors' well proven range of TO 220 triacs. The advantage of isolated tab construction - easy assembly using a mounting clip and an optimised thermal impedance - are combined with the increased current carrying capability of the TOP 3 construction. This opens up a new spectrum of high power application areas such as motor speed control, solid state relays, heating and lighting regulation.

Alternistors :

The alternistor has been specifically developped for exceptionally demanding triac applications where high commutating dv/dt and di/dt ratings are required. Capable of switching at 200 V/µs at rated di/dt, the bidirectional alternistor is ideally suited to handling inductive loads and can advantageously replace two back-to-back thyristors thus drastically decreasing assembly costs.

In the same TOP 3 case, Thomson Semiconductors also proposes power transistors, fast recovery rectifiers and voltage regulators.

THOMSON SEMICONDUCTORS Sales headquaters 45, avenue de l'Europe - 78140 PARIS-VÉLIZY - FRANCE - Tél. (3) 946.97.19.

Far East Asia
HONG KONG
Tel. (3) 721 96 82

W. Germany
MUNCHEN
Tel. (089) 7879 0

Italy
MILANO
Tel. (2) 688 41 41
ROMA
Tel. (3) 31 92 42 34

Japan
TOKYO
Tel. (3) 264 63 46

South East Asia
SINGAPORE
Tel. (65) 295 31 24

Spain
MADRID
Tel. 405 16 15
BARCELONA
Tel. (3) 373 30 11

Sweden
STOCKHOLM
Tel. (08) 63 50 60

United Kingdom and Ireland
BASINGSTOKE
Tel. (256) 29 155

U.S.A.
CANOGA PARK CALIFORNIA
Tel. (818) 887 10 10
MONTGOMERYVILLE
Tel. (215) 362 85 00

Circle 75 on reader service card

5330

Submarine Engineering. Tomorrow is today at NUSC

The Naval Underwater Systems Center is the Navy's principal research, development, test and evaluation center for submarine warfare and submarine weapon systems. We provide high technology vital to the Navy's tactical and strategic edge in combat systems (sonar, combat control, electromagnetics, underwater weapons and targets, weapon launch and handling), surface ship sonar and undersea ranges.

Engineers and scientists who join the Center's laboratories at Newport, Rhode Island and New London, Connecticut, are encouraged to take responsibility almost immediately. They design, develop and test prototypes of these systems and work with private industry on production of the final product.

"I got responsibility right away," says Ronald Jackson, an electronic engineer. "As I showed ability, my responsibility grew. Today, I'm a project engineer." Through NUSC's liberal education policy, Ron has earned a master's since he joined Newport and is working toward a Ph.D.

Because the Center helps its scientists become expert in other fields, electronic engineer Donna Doane is concentrating on computer software. "I'm doing things people never have done before," Donna says. "I design the project, and I see it to the end—to the final product." Monica Sachs is learning something new each day. "I'm working on weapons systems engineering, a broad subject that allows you to get into several different kinds of engineering. I use my electronic engineering background to understand the other disciplines." And Peter Santiago applies his computer background to quality assurance. "I look for self-gratification in the job, and I get that at NUSC."

We seek graduating and experienced electronic and computer engineers with degrees from accredited colleges and universities. We also need computer scientists with degrees from colleges and universities affiliated with a school of engineering and specializing in scientific and technical applications.

We offer you challenge, freedom to be innovative and creative, and the opportunity to contribute your skills to our national defense.

And the living is good, too! Newport and New London areas are popular for their excellent beaches, fishing and sailing.

We believe we have both the challenge and the opportunity for you. For further information, contact Naval Underwater Systems Center, Personnel Staffing Division, E Newport, Rhode Island 02841 or call (401) 841-3585.

DEPARTMENT OF THE NAVY UNDERWATER SYSTEMS CENTER

An Equal Opportunity Employer
U.S. Citizenship Required

32-BIT SYSTEMS SUIT A VARIETY OF APPLICATIONS

Family of 32000-based systems includes an instrument controller, four 32-bit work stations, four graphics displays, and software ☐ *by Tom Manuel*

The fable of the tortoise and the hare may wind up being an apt analogy for the story of Tektronix Inc.'s entry into the computer-aided-engineering work station market. A whole new industry blossomed when such start-ups as Mentor Graphics, Valid Logic Systems, Daisy Systems, and 70 or 80 other firms, along with instrument and computer maker Hewlett-Packard Co. started offering CAE work stations about two years ago. But the Beaverton, Ore., firm is just now introducing its machines—and the hares have quite a head start.

In its early days, Tektronix became a leader in test and measurement, particularly with its oscilloscopes. Out of its scope research and development, it developed the direct-view storage-tube display and thus started the computer-graphics industry. Though the company was slow to recognize the demand and market potential for color displays, it did enter that market in 1983 with a quality product line that has been well received.

Until now, however, Tektronix had not offered engineering work stations based on complete 32-bit microcomputers. The 6000 family of work stations based on the National Semiconductor 32000 family of microprocessors and support chips is the basis of the new Tektronix thrust into the rapidly growing new industry of graphics work stations.

The 6000 family consists of two groups of products, the 6100 series and 6200 series, summarized in the table below. The low-end 6110, using the 32016 processor, is offered, without a display terminal, as an instrument controller. Because of the industry-standard networking and communications capabilities available with the complete 6000 product line and the existing 4100 series of display terminals, the 6110 and the rest of the family can be integrated into complex, high-performance engineering computer systems.

The 6000 and 4100 families' wide range—from the 4010 terminal and the 6110 work station, up to the high-end 6212 work station—offers users a great degree of flexibility. Adherence to industry standards such as the AT&T Bell Laboratories Unix operating system, the Ethernet local network, the IEEE-488 interface bus, and the Graphics Kernel System (GKS) graphics allows systems to work with many existing computers within the users' environment.

Separately priced display stations in the 6000 family offer a wide choice in a mix-and-match approach. New

TEKTRONIX 6000 FAMILY OF WORK STATIONS

Model	6110	6120	6130	6205	6210	6212
Processors	32016 (1)	32016 (1), 32-bit display processor, 32081 floating-point processor	32016 (1), 32-bit display processor, 32081 floating-point processor	32016 (1), 32016 I/O processor, 32-bit display-list processor, bit-slice vector processor	32032 (1), 32016 I/O processor, 32-bit display-list processor, bit-slice vector processor	32032 (2), 32016 I/O processor, 32-bit display-list processor, bit-slice vector processor
Main memory						
(Basic)	256-K bytes	1 megabyte	1 megabyte	1 megabyte	1 megabyte	1 megabyte
(Add-on up to)	2 megabytes	2 megabytes	2 megabytes	9 megabytes	9 megabytes	16 megabytes
Basic mass memory	360-K-byte floppy disk drive	360-K-byte floppy disk drive, 10-megabyte Winchester drive	360-K-byte floppy disk drive, 20-megabyte Winchester drive	40-megabyte Winchester drive	40-megabyte Winchester drive	80-megabyte Winchester drive
Basic price (without display)	$4,995	$7,995	$9,500	$13,950	$17,950	$35,950

6100 series display stations include a 15-in. 640-by-480-pixel-resolution monochromatic display and a 13-in. 16-color display with the same resolution. High-performance (1,024-by-768-pixel resolution) 19-in. color and monochromatic displays are available for the 6200 series. In addition, the popular Tektronix 4010, 4100, and 4110 graphics display terminals can be used with any of the 6000 systems.

Tektronix supplies software in the form of a variety of industry-standard programming languages and general applications. Included are documentation tools and project management program, graphics editing, statistical analysis, spreadsheet, and office automation packages—all integrated with the Ingres relational data-base management system. Several design application software packages from independent software vendors will also be available.

The 6000 family of work stations, which can be ordered now, will be available for delivery starting in February 1985—the 6110 and 6212 (low and high ends) will not be available until May 1985.

Tektronix Inc., Marketing Communications Department, Delivery Station 63/635, P.O. Box 1000, Wilsonville, Ore. 97070. Phone (503) 644-0161 [Circle reader service number 338]

Cards for IBM Portable add memory, ports, and calendar

The Minimax and Ideamini are plug-in expansion cards for the IBM Personal Computer. The Minimax is designed for short slots and offers up to 384-K bytes of random-access memory in a double-decker configuration. The Ideamini input/output card also fits the IBM Portable PC and offers a choice of options for two serial ports, parallel port, and clock and calendar.

With 128-K bytes on the baseboard plus 256-K bytes on the override card, the Minimax takes only one slot on the IBM PC, XT, or Portable. In addition to its choice of serial and parallel ports and clock and calendar options, the Ideamini I/O is designed with a COM3 port that allows the user to link four PCs, XTs, or Portables in the manufacturer's Ideashare local network.

Both Minimax and Ideamini come with a library of multifunction software. With the Ideamenu software, users can configure a boot disk without editing files. Prices for the Minimax range from $295 with 128-K bytes to $625 with 384-K bytes. Ideamini prices range from $195 with one option to $270 with four options. Both are available now.

IDE Associates Inc., 7 Oak Park Dr., Bedford, Mass. 01730. Phone (617) 275-4430 [Circle 365]

Single card adds memory, interface ports to HP 150s

A multifunction expansion board called the Slotsaver, for the Hewlett-Packard 150 personal computer, combines large-scale integrated circuits and 256-K dynamic random-access memory technology on one board. The Slotsaver has 256- or 384-K bytes of main memory, a parallel printer port for Centronics-style printers such as Epson and the HP-2225C Thinkjet, and an HP interface loop port for communicating with the HP-110 portable and other HPIL peripherals.

The Slotsaver combines in one slot the memory and input/output functions that formerly required two slots. In its maximum configuration, it brings the HP-150 up to its full 640-K-byte memory capacity for large spreadsheets and other memory-intensive applications. It is also said to be fully compatible with the HP memory-expansion accessories and the HP extended I/O accessory.

A separate board, the Permanent Memory Slotsaver, has the same memory and I/O features and can support up to 128-K bytes of programmable read-only memory.

The Slotsaver Model 650A (256-K bytes) is priced at $745; the Model 651A (384-K bytes) is $995. Available now, delivery is two weeks.

Kelly Co., 1544 Redwood Dr., Los Altos, Calif. 94022. Phone (415) 960-0154 [Circle 364]

SIP technology lets VMEbus board hold 1 megabyte

Single in-line packaging technology that places 64-K dynamic random-access memories on 36 SIP motherboards has given birth to a VMEbus 1-megabyte memory board from Mostek. The MK75702 DRAM board is the firm's eighth VMEbus-based module and represents the first of a new generation in that family, says William Gaffney, product line manager.

Residing on the same double Eurocard form factor as Mostek's two-year-old MK75701 256-K-byte memory board, the new VMEbus DRAM module features a new 32-bit—or long-word—cache with typical read-access times of 135 ns on a cache hit and 300 ns on cache miss. This feature readies the VMEbus board for the coming generation of 32-bit microprocessors.

For 16-bit VMEbus systems, the new megabyte board enables host microprocessors to use the long-word cache for quick sequential access of 16-bit words. The second 16-bit word can be accessed in 109 ns. By using the

Got
a second?

TEB Inc.

That's all it takes to put your system on a chip. With MegaPAL™ arrays.

One of these engineers built a system this morning.

A system on a chip.

A VLSI chip with 5,000 gates of programmable logic.

A chip called a MegaPAL array.

What's a MegaPAL array?

Glad you asked.

MegaPAL arrays are simply the newest members of our Programmable Array Logic (PAL®) family.

Today, they offer from 1,500 to 5,000 gates. And even greater complexity is on the way.

Using our enhanced PALASM™ CAD software, you can design, test and program a MegaPAL array in just hours.

And you can build a prototype in seconds.

Then, when your design is stable you can build as many MegaPAL arrays as you need. Or convert your design to our mask-programmed MegaHAL™ arrays.

As you can see, MegaPAL and MegaHAL arrays offer some very real and distinct advantages.

And we think they're going to change the way you think about logic design. For a long time to come.

Which brings us back to the picture.

The engineer who built his system on a MegaPAL array is on his way to lunch with the boss.

And the other engineers are going back to their offices to think about that.

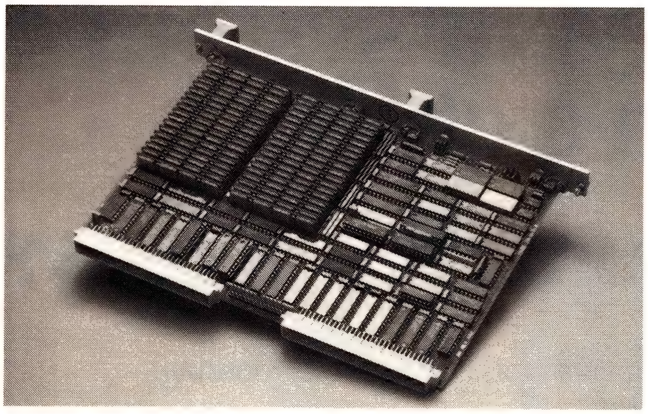
Call your local Monolithic Memories representative or franchised distributor for more information and a copy of our MegaPAL brochure.

Or write Monolithic Memories, 2175 Mission College Blvd., Mail Stop 9-14, Santa Clara, CA 95054.

MegaPAL, MegaHAL and PALASM are trademarks and PAL is a registered trademark of Monolithic Memories, Inc. © 1984 Monolithic Memories, Inc.

Monolithic Memories MMI

Circle 81 on reader service card



SIPs—each carrying four 64-K DRAMs housed in chip carriers—Mostek can place four times the memory in the same board space as it could with conventional dual in-line packages.

Mostek intends to apply the same packaging technique to 256-K DRAM chips, offering a 4-megabyte VMEbus storage board early in 1985. Now in volume production, the 75702 memory board is priced at $3,500 each in single-unit quantities. Like Mostek's previously introduced VMEbus memory modules, the 1-megabyte board contains a control and status register, which allows software selection of starting addresses on any 4-K-byte boundary. With this programmable feature, system users can configure the system memory easily. Starting address on the megabyte board can also be set by jumpers with hardware straps.

The 75702 is available with or without parity generation and checking. The board can make data transfers of 8-bit bytes or 16-bit or 32-bit words. It has 23-bit addressing and light-emitting diodes to indicate when the board is being accessed. For designers wishing to customize the board, address modifiers can be decoded in programmable read-only memory.

Mostek Corp., 1215 W. Crosby Rd., Carrollton, Texas 75006.
Phone (214) 466-6000 [Circle 383]

PWM FET amplifier switches noiselessly at 120 kHz

Switching at a frequency of up to 120 kHz with no audible noise, the models 220 and 230 dc servo pulse-width-modulated field-effect-transistor amplifiers are designed to provide a wide range of dc power with low ripple for motor control. They come complete with all the low-level electronics that they need to operate alone as a rate loop or as an inner loop in a position control system.

"Most PWM servo amplifiers available today switch at 5 to 10 kHz," says Barry Friedman, vice president of marketing for Copley Controls Corp., a new firm. He adds that he knows of one amplifier that switches at from 15 to 20 kHz.

The 220 is rated for continuous operation at 0.9 kW (12 A at 75 V) with a peak limit of 18 A for 2 s; the 230 is rated for continuous operation at 1.5 kW (10 A at 150 V) with a peak limit of 15 A for 2 s. Both models are designed to drive permanent-magnet dc motors in closed-loop or velocity-controlled systems. The output from either amplifier is filtered to deliver pure dc to the motor, thereby eliminating radiated and induced radio-frequency interference and the corresponding undesirable effects on sensitive electronic circuitry. Further, the designer does not need to use external inductors, making these amplifiers a suitable choice for applications with low inductance motors, the company claims.

Power output may be increased significantly by virtue of a master-slave building-block concept. Output current capability can be multiplied—to 31.5 kW—by adding up to 20 slave units. When the amplifiers are used in this manner, frequency synchronization, current limiting, and voltage and current feedback are all controlled by the master unit.

The 220 and 230 are packaged in 7.8-by-12.9-by-2.25-in. modular packages and may be surface-mounted with or without a finned heat sink. Power requirements are ±15 V dc and a high voltage supply either +20 to +80 V dc for the 220 or +40 to +170 V dc for the 230, depending on the motor winding.

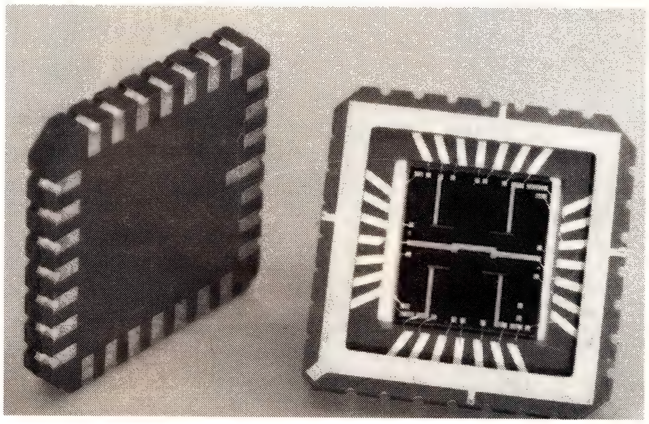
Available in four to six weeks after receipt of order, the 220 sells for $1,060, and the 230 goes for $1,310.

Copley Controls Corp., 375 Elliot St., Newtown, Mass. 02164.
Phone (617) 965-2410 [Circle 381]

20- and 28-pin carriers meet JEDEC specifications

A family of standard and custom thin-film resistor networks and hybrids, the LCC/J series, has been extended to include 20- and 28-pin Joint Electron Device Engineering Council type C leadless chip carriers. These surface-mountable devices are available with pinouts in compliance with JEDEC standard No. 1 or with pinouts for critical applications where minimized internal conductor lengths or parasitic reactances for higher accuracy and thermal stability are at issue.

The manufacturer of the LCC/J series is prepared to offer such services as design, fabrication, packaging, and 100% testing to meet commercial through MIL-STD-883C requirements. Nonstandard products will be either built to the user's design or designed by the manufactur-

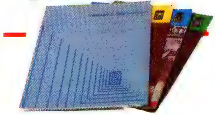


Secure upward mobility –
For your links with W&G datacom test equipment

he performance of datacom net-
orks can rise or fall. It will fall
/ itself. Its quality will rise with
wer transmission errors, less
owntime, faster trouble analysis
nd quick removal of impair-
ents. Hence, test instruments
om Wandel & Goltermann can
ing you a lot of help.
'e have designed 10 powerful
easuring instruments for trouble-
hooting and field service of data
nks. Covering all common ana-
g and digital parameters. Up
five will fit into the DMS-1, the
ix and match field case which
ermits assembling test capability
ccording to your specific needs.
Vhether for telephone companies, or information networks within transportation, insurance and banking organizations, in fact, anywhere where data channels are found – we can help you with the correct measurement tool.

★ Interface Testers (RS-/V. and X. access points)
★ Switching and patching of links-protocol and channel simulation
★ Modem Tester with bit- and block-error rate, bias distortion, timing measurements for V.24/ RS-232C interfaces.
★ Data Circuit Measuring Set for impulse noise and drop-out according to CCITT O.71 and O.62.
★ Level Generator and Level and Noise Meter, 15 Hz to 20 kHz.

From the simple field instrument to the sophisticated protocol analyzer – come to W&G for your test needs. Ask for free information.



EL 24/9/84

E 2249 KF

Please send me:
☐ Information about the DMS-1
☐ Your "Data Product Line"
☐ An applications engineer

Name ....

Firm ....

Address ....

Street ....

Tel. No. ....

Wandel & Goltermann
P.O.Box 45 · Abt. VW
D-7412 Eningen u. A.
Fed. Rep. of Germany
Tel. +(49) 7121-8911
Telex 729833 wug d

Circle 100 on reader service card

er to meet the customer's particular specifications.

A variety of custom hybrid designs and custom thin-film resistor networks in leadless chip carriers are offered to meet such applications needs as precision analog-to-digital and digital-to-analog ladders, operational-amplifier gain-setting networks, independent resistor arrays, and others.

Pricing varies with device complexity and required performance, screening, and quantity. Prices for the standard JEDEC-compatible products range from $15 to $30 in quantities of 100. Assorted types of JEDEC-compatible hybrid voltage references range from $44 to $95 in 100s. Typical availability is from four to six weeks in production quantities.

HyComp Inc., 75 Union Ave., Sudbury, Mass. 01776.
Phone (617) 443-4631 [Circle 357]

Ink-jet printer produces 18 pages/min at 300 dots/in.

Using a patented technology that offers full-page all-points addressable printing, a multifunction ink-jet printer combines graphics and text at a resolution of 300 dots/in. with print speeds of up to 18 pages/min. Standard features of the printer include 128-K bytes of internal buffered random-access memory, a resident multipurpose font set, automatic duplex (two-sided) printing, a Centronix interface, and Xerox 2700 emulation. In addition, it has a 500-sheet input/output bin capacity and self-test diagnostics.

The printer's formats, which are controlled by the host terminal, provide flexibility in full-page character and graphics printing. Superscripts and subscripts are automatic. The printer can print in either portrait or landscape modes or a combination of both, with a variety of type fonts, including logotypes.

Graphics and text can be either combined or overlaid on the same page, facilitating special printing requirements such as forms. Type sizes ranging from 4 to 36 points can be combined within any document, which allows for a great degree of design flexibility.

The printer uses binary-deflection multiple-array ink-jet technology, in which the print bar contains an array of microscopic holes and produces millions of ink droplets per second; this results in sharp, highly legible images. The printer, which can print faster when only draft-quality documents are needed, will sell for between $5,000 and $7,000 in original-equipment manufacturer quantities. Deliveries will begin early next year.

Diconix Inc., 3800 Space Dr., P.O. Box 3230, Dayton, Ohio 45431.
Phone (513) 898-3644 [Circle 382]

Touch screen manages a graphics-video system

With the model TS-200, a touch screen that controls the GraphOver 9500 interactive graphics-video system, the operator can select functions from a menu, draw directly on the screen, or control the combined graphics-video sequence in a highly interactive manner. The operator can use a finger, pen, or other pointer.

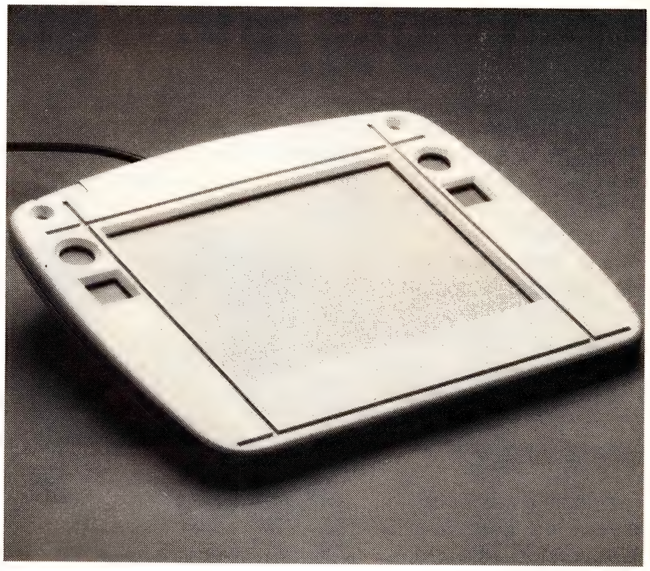
The TS-200 offers a resolution of 768 by 484 pixels, a high resolution for a system that combines graphics and NTSC video. Other scaling factors can be selected under software control.

Available now, the TS-200 sells for $2,250; quantity discounts are available.

New Media Graphics Corp., 279 Cambridge St., Burlington, Mass. 01803. Phone (617) 272-8844 [Circle 380]

Keyboard tablet reduces long commands to keystroke

With the appropriate software, the ErgoPad Tablet augments keyboard data input and reduces long commands to a single keystroke. The peripheral, color-coordinated for use with the IBM Corp. Personal Computer, the Apple II, and Commodore 64, plugs into the game port and consumes only 25 mA from the host computer's 5-V power supply.



Available software enables users to create charts, disks, circles, rectangles, signs, free forms, and music. The tablet can replace analog joysticks in many applications, says the company. Weighing 1.5 lb, it has an active drawing area of 5.8 by 4.8 in. and a resolution of 256 active points per axis. Duplicate touch switches are located on both sides for right- or left-hand operation. The tablet comes with a tiltable working surface and a self-storing drawing aid in a rugged case.

Scheduled to be available in early 1985, versions of the Ergopad Tablet for the PC, Apple II, and the Commodore 64 will sell for $129.95, $119.95, and $89.95, respectively. Prototypes are available now.

Illinois Tool Works Inc., Entrex Division, 6615 West Irving Park Rd., Chicago, Ill. 60631. Phone (312) 282-9440 [Circle 379]

A 13-MHz function generator is easy to calibrate

A function generator that offers sine, square, triangle, and haver waveforms, inverted waveforms, variable-symmetry waveforms, and dc permits the selection of frequencies from 100 μHz to 13 MHz using nine overlapping ranges. Within each range, the model 627's frequency may be varied over a ratio of 1,300:1. Operating modes include run, gate, trigger, and inhibit.

The manufacturer says that the calibration method for the 627 is an especially convenient feature. There are no screwdriver adjustments; instead, all calibrations are made from the front panel or under IEEE-488 interface control.

A 3½-digit light-emitting diode display shows all numerical parameters. Additional front-panel LEDs show the nonnumerical parameters selected. Current operational parameters are stored in nonvolatile memory and can be recalled when the unit is powered down and then powered up again.

The following parameters can be entered with the function generator: frequency, amplitude, offset, symmetry, and calibration sequence number. A decimal point and LED indicate the multiplier.

The 627 programmable function generator sells for $1,995. Delivery will be made from six to eight weeks after receipt of order.

Dynatech Nevada Inc., 2000 Arrowhead Dr., P.O. Box 1925, Carson City, Nev. 89702. Phone (702) 883-3400 [Circle 352]

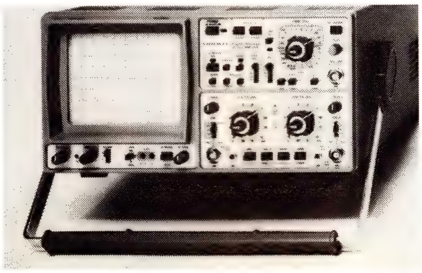
Dual-channel oscilloscope stores four traces in memory

A digital-storage oscilloscope, the HM-208, offers dual-channel storage with 20- and 10-MHz digitizing rates in single- and dual-channel modes, respectively. Its 8-bit memory stores 4,096 points in the single-channel mode or 2,048 points per channel in the dual-channel mode. It is possible to store four traces in memory (two in each channel), for retrieval and comparison or for output to a pen recorder.

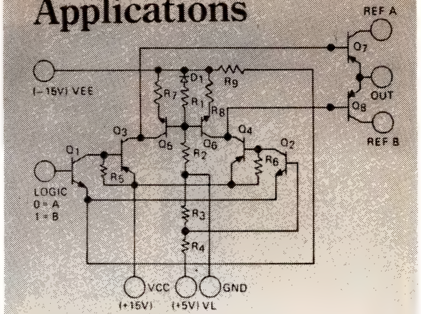
Roll and refresh modes permit the study of slow signals. Aperiodic or one-time events are observed by means of a selectable pretrigger to capture 0%, 25%, 50%, 75%, or 100% of the signal.

Acceleration voltage on the cathode-ray tube is 14 kV, which the manufacturer says will ensure bright and clearly defined traces. The HM-208 has the option of X-Y operation and storage of Lissajous figures. Other options are a buffer battery for memory protection and a data-bus interface (send only).

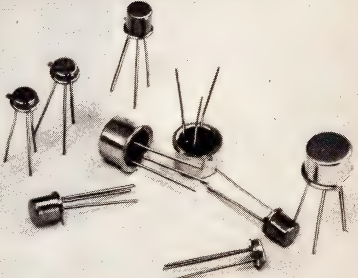
Available in the fall of 1984, the



Selected Applications



Select Devices



Bipolar Transistors

Aerospace Military Medical

Crystalonics developed the epitaxial junction process for chopper and switching transistors and continues to be the leader in the technology. Our line includes:

- NPN Low Level Switching and Chopper Transistors: BVEBO to 30V, r_{ec} (sat) to 2 Ohms and H_{fe} (inv) to 30 (2N6566); V_O to 0.4 mV (2N2432A).
- PNP Low Level Switching and Chopper Transistors: BVEBO to 50V (2N5231), H_{fe} (inv) to 50 and V_O to 0.3 mV (2N2944A); r_{ec} (sat) to 2 Ohms (2N6567).
- Dual Emitter Choppers, NPN and PNP: BVEEO to 50V, V_O to 30 μV, and r_{ee} (sat) to 15 Ohms.
- Complementary Ultra-Low r_{ec} (sat) PNP/NPN Switches: BVEBO 30V, V_O 1 mV, and r_{ec} (sat) to 2 Ohms.
- JAN/JANTX/JANTXV Transistors: qualified on over 20 types, including the popular series 2N2432 and 2N2946.
- NPN Grown Junction Replacements, including JAN2N333 thru 2N343.

For further information send for our short form catalog.

TELEDYNE CRYSTALONICS

147 Sherman Street
Cambridge, MA 02140
Tel: (617) 491-1670
TWX 710-320-1196

Circle 85 on reader service card

THE BEST VISION SYSTEM INDUSTRY HAS EVER SEEN.

AFFORDABLE VISION WITH VOLUME DISCOUNTS.

The best and fastest solution for Q.C., gauging, recognition, vision development and robotics is also the most affordable. The P256 from IRI is the highest performance vision system in the industry, and it's in the field at companies like yours right now. Let us demonstrate your application today.

Speed is the most important system attribute. Because the P256 is many times faster than human vision, it eliminates manufacturing bottlenecks. A powerful built-in 12MHz, MC68000 host computer executes 1 million instructions per second. For even more speed, an optional co-processor performs 40 million arithmetic operations per second.

The P256 features four frames of 256x256 pixels with 256 grey levels. It performs image convolutions (3x3:33ms); has the ability to add/subtract/multiply two frames (20ms); simultaneously calculate zero, first and second moments of inertia (20ms); and even perform a "Roberts gradient" (20ms). You'll also see the best industrial board packaging for reliability with on-line diagnostics to keep your system running at peak productivity.

Here's a vision system you can start with—in development—and use—in production. Advanced software packages include testing as well as program development, plus the power of UNIX™ V or super FORTH to create your own programs. And to custom tailor the P256 to your application, you can draw on a wealth of optional peripherals. For a package solution call upon IRI's Automation System Group.

For the best vision solutions at the best price, we have something you must see. Our large user and OEM quantity prices are the best in the industry. For a demonstration, information, or a direct quote, call Eli Gruber, director corporate sales.

INTERNATIONAL ROBOMATION/INTELLIGENCE
2281 Las Palmas Drive, Carlsbad, CA 92008
Phone: (619) 438-4424, Telex: 182 802 Robot CSBD

IRI
INTERNATIONAL ROBOMATION/INTELLIGENCE

Circle 87 on reader service card

HM-208 digital-storage oscilloscope is priced at $2,380 each; quantity discounts are available.
Hameg Inc., 88-90 Harbor Rd., Port Washington, N.Y. 11050. Phone (516) 883-3837 [Circle 353]

Monolithic chip houses four d-a converters

Low per-channel cost and smaller size are provided by the MP7628, a monolithic complementary-MOS chip that consists of four 8-bit digital-to-analog converters. All the converters, housed in 28-pin dual in-line packages, feature separate on-chip latches for microprocessor interfacing, linearity up to ±⅛ least significant bit, a single 5-V supply voltage that dissipates less than 20 mW of power, and bus-compatibility with most 8-bit microprocessors, including the 6800, 8080, 8085, and Z80.

The MP7628 is designed for applications wherever multiple voltages must be set independently by a digital source. Four separate reference inputs are available, and the MP7628 shares a common digital bus by way of addressable latches with four analog voltage outputs, giving full functional read/write capability.

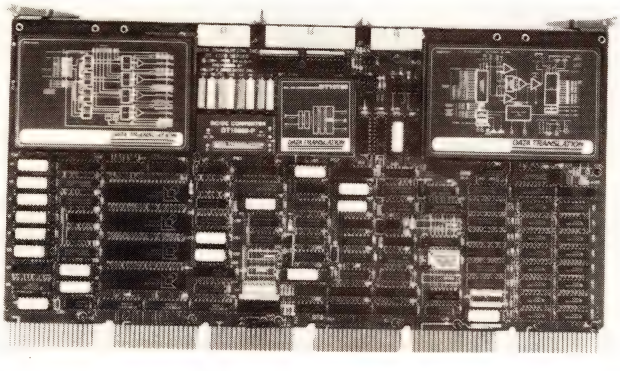
The MP7628 is offered in 8-, 9-, and 10-bit linearities and in commercial, industrial, and military temperature ranges, with 28-pin plastic or ceramic DIP packaging.

Pricing begins at $21 each in lots of 100 pieces for the MP7628KN (the 9-bit plastic-packaged commercial model). Delivery is four weeks after receipt of order, or from stock from distributors.
Micro Power Systems Inc., 3100 Alfred St., Santa Clara, Calif. 95050. Phone (408) 727-5350 [Circle 351]

I/O, converter boards serve Unibus under VMS, Unix

A line of analog input/output boards and real-time support software for Unibus, the DT1771 series is equipped with on-board intelligence, analog-to-digital and digital-to-analog conversion capabilities, digital input/output facilities, and programmable timer subsystems. Software support is under the VMS, Unix, and RSX-11M operating systems.

The architecture of the DT1771 series is based on an on-board, 8-million-instructions/s, 16-bit-slice processor optimized for analog I/O operations and a 64-K memory buffer. Data transfers are conducted through a first-in-first-out buffer. Eight modes of analog I/O are available: continuous data acquisition, count-down data acquisitions, pre- and post-event sampling, signal averaging, histogramming, and continuous a-d and d-a conversion with external initiation.



The board can perform all these functions automatically. Real-time software support is available under RSX-11M and RSXLIB, VMSLIB, and UNIXLIB operating systems. An applications program runs in either Fortran or C.

The DT1771, an 8-channel 12-bit card, and the DT1777, a 4-channel 16-bit card, are priced at $7,870 each. The DT1778, which is a 4-channel 12-bit system, is priced at $7,170. The initial license fee is $3,295 for VMSLIB and UNIXLIB and $1,995 for RSXLIB. Delivery of all products takes 10 days after receipt of order.
Data Translation Inc., 100 Locke Dr., Marlboro, Mass. 01752. Phone (617) 481-3700 [Circle 350]

Front-loading 16-bit latches cut component count

Housing two 8-bit chips in one package, these bidirectional 16-bit front-loading latches can replace two or more interface parts with one, the manufacturer says. A front-loading latch is an edge-triggered flip-flop in parallel with a buffer. A multiplexer, acting as a switch, selects between the flip-flop and the buffer for storing and transmitting data. In a bidirectional integrated circuit, data can enter or exit from either side.

Designated the SN74LS646, SN74LS647, SN74LS648, and SN74LS649, these ICs have a maximum data-to-output delay of 25 ns, a maximum clock-to-output delay of 35 ns, and a clock frequency of 25 MHz.

Each IC is configured differently. The SN74LS646 (inverted) and the SN74LS647 (noninverted) are three-state outputs; the SN74LS648 (inverted) and the SN74LS649 (noninverted) are open-collector outputs.

In quantities of 100, prices are $6.78 each for parts in plastic Skinnydips and $8.15 each for models in ceramic packages. Military versions of the parts—the SN54LS646, SN54LS647, SN54LS648, and SN54LS649—are also available. Shipments will be made from stock.
Monolithic Memories Inc., 2175 Mission College Blvd., Santa Clara, Calif. 95050. Phone (408) 970-9700 [Circle 344]

Two quad D flip-flops make debut in CMOS

Two versions of the quad D-type flip-flop with complementary outputs are offered in QMOS, the manufacturer's solid-state family of high-speed complementary-MOS logic chips. The CD54/74HC175 flip-flops are intended for high-speed CMOS designs; the CD54/4HCT175 flip-flops are speed-, function-, and pin-compatible with low-power Schottky TTL. These latter types directly replace LSTTL chips in existing systems that can benefit from the substantially lower power consumption of CMOS technology.

All four flip-flops in a package are controlled by a

YEW's New, All-in-One Recorder

12-channel analog/digital data printout and DMM capability.

YEW MODEL 3087 PORTABLE HYBRID RECORDER
YOKOGAWA HOKUSHIN ELECTRIC

GP·IB

**Model 3087
Portable
Hybrid
Recorder**

The new YEW Model 3087 Programmable 150mm Hybrid Recorder accepts 12-channel inputs of DC V, seven standard TC's and RTD, plus a DMM input. It prints out analog data in six clear, distinct colors together with digital data. A true all-in-one design, the 3087's powerful functions cover an almost unlimited number of applications. Full-scale range, chart speeds, and alarms are programmable for each of the 12 channels. In the digital mode, computed data, ⊿T, alarms or a program list is also printed out. And one multi-color ribbon cassette gives approximately six months of continuous use. For more information, contact Yokogawa Corp. of America, (404) 253-7000. In Europe: Yokogawa Electrofact B.V. (The Netherlands), (0)33-10543. In Japan: Yokogawa Hokushin Electric Corp., (03) 349-0621.

All-in-One

YEW
YOKOGAWA HOKUSHIN ELECTRIC

Circle 89 on reader service card

common clock signal. Each flip-flop is reset independently of the clock by a common master reset input. The true and complementary outputs of each flip-flop are brought out as package pins. Both versions operate at the high speed of LSTTL chips.

Typical propagation delay from a clock input to a data output is specified at 14 ns. The chips operate up to a maximum clock frequency of 50 MHz, says the manufacturer. The military CD54HC and HCT versions are packaged in a 16-pin dual in-line ceramic hermetic case, while CD74HC and HCT types are packaged in a 16-pin dual in-line plastic case.

In quantities of 100, the CD74HC175 and HCT175 in plastic packages are priced at $0.83 each.

RCA, Solid State Division, Rte. 202, Somerville, N.J. 08876.
Phone (800) 526-3177

Controller adds graphics to VMEbus-based computers

With a high-resolution graphics controller, any VMEbus-based computer can generate and display mixed graphics and alphanumeric symbols. The Force GDC-1 can be used with either monochrome or color raster-scan monitors. The system consists of a GDC-1M master board and one, two, or three GDC-1S slave boards, which communicate by way of a local control bus.

The master board provides local intelligence with an on-board graphics interpreter implemented by an MC-68000 central processing unit. The board contains three 2-K-by-8-bit color maps and three 8-bit digital-to-analog converters for video output generation. Each slave board has one NEC-7220 graphics processor, a 512-K-byte video random-access memory, and video timing and zoom logic circuitry.

A minimal configuration consists of one master and one slave board. This system can be structured for nearly any display format with 1,000,000 pixels, each pixel 4 bits deep. If more bits per pixel are required, systems may be stacked to a maximum of 12 bits per pixel.

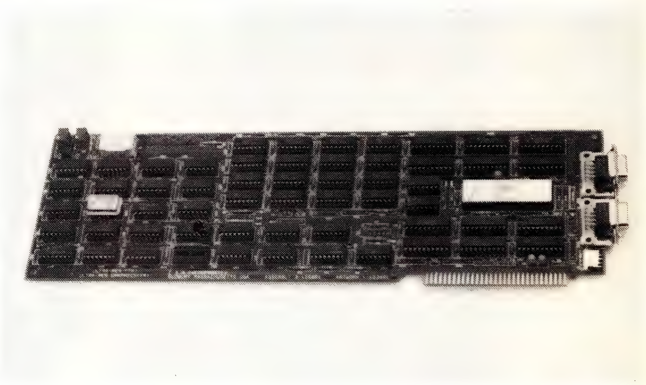
The display system performs scan-line conversion at a stated 3 ms per pixel. The system also supports raster copy operations and generation of circles, ellipses, and stipple-filled and color-filled rectangles. A preprogrammed character generator produces characters and symbols with 16 different sizes, 8 selectable directions, and 2 fonts.

Available from stock, the price of the minimal-configuration system is $3,800.

Force Computers Inc., 2041 Mission College Blvd., Suite 150, Santa Clara, Calif. 95054. Phone (408) 988-8686 [Circle 346]

Single-board controllers give 1-by-1-K display resolution

Two graphics systems, the Ultra-Res 4-79 and 4-111, provide a programmable display resolution of up to 1,024 by 1,024 pixels interlaced from a memory of 1,024 by 1,024 or 2,048 by 2,048 bits. The controllers occupy one slot in the host and can be programmed through input/output commands or direct memory access to draw vectors, circles, and arcs at rates up to 1,000,000 pixels/s, the manufacturer says. Zoom is from 2× to 16×, and pan is smooth vertically and coarse horizontally.



The controller presents a standard nine-pin Type-D connector for TTL gate direct drive, or an analog video signal may be generated. Software drivers are provided in Fortran. Optional drivers include a subset of Plot-10. Slave adapters for color or overlays are among the advanced features, and the transparent mode allows a monochrome controller and Ultra-Res adapters to drive the same monitor. Ultra-Res models 4-79 and 4-111 run on the IBM PC and compatible systems.

Price of the 4-79 graphics adapter is $995; the 4-111 sells for $2,000. The units are available now.

CSD Inc., P.O. Box 253, Sudbury, Mass. 01776.
Phone (617) 443-2750 [Circle 347]

Multiprocessor system supports eight stations

With system architecture designed to be compatible with the IBM Personal Computer, the PC XT, and the manufacturer's own PB400 desktop model, the Mega personal computer will run either as a stand-alone unit or in an integrated system of up to eight user work stations.

The Mega's main file-server board incorporates an 8088 microprocessor and 256-K bytes of random-access memory, expandable to 512-K bytes on the main board; a hard-disk controller with a clock/calendar; choice of a 10-, 20-, or 40-megabyte Winchester disk drive; a 16-K-byte read-only-memory-based operating system that boots to hard disk; a floppy-disk drive; one serial port; and one Centronics-type parallel port.

An additional board contains 11 IBM PC-compatible bus-expansion ports. Up to eight slots can be used for applications processor cards, each incorporating an 8-MHz 8088 microprocessor. Therefore, the manufacturer claims, each of these cards functions as a separate computer and the Mega does not suffer from system degradation as it approaches full capacity.

Hard-disk resources may be shared by all users in the multifunction, multiterminal mode. A two-user (256-K bytes of RAM per user) Mega personal computer with a 10-megabyte hard-disk drive has a list price of $7,805. Each additional work station with its processor card is

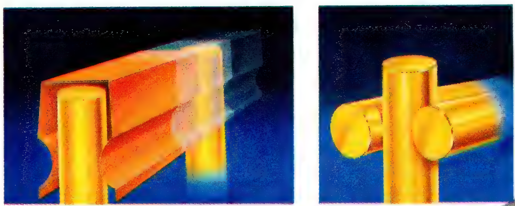
NKK ANNOUNCES THE WORLD'S MOST RELIABLE LOGIC-LEVEL SWITCH CONTACT MECHANISM.

SLIDING TWIN CROSSBAR

Entire Sliding Twin Crossbar system gold-plated.

Logic-level switch reliability has taken a quantum leap forward with the introduction of NKK's patented, award-winning Sliding Twin Crossbar contact mechanism.

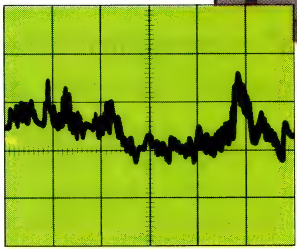
The new gold-plated design utilizes a self-renewing action that literally wipes the switch's contacts clean with each actuation. Furthermore, after the contact area is cleansed by the sliding motion, the contact surface is "pinched" by the cylindrically shaped sides of the movable contactor. The effect is that of twin crossbars gliding into position to make contact. The result is highly stabilized, highly concentrated contact which creates increased reliability at logic-level.



GOLD-PLATED SLIDING TWIN CROSSBAR CONTACT PRODUCES SMOOTHER OPERATING ACTION AS WELL AS UNMATCHED RELIABILITY.

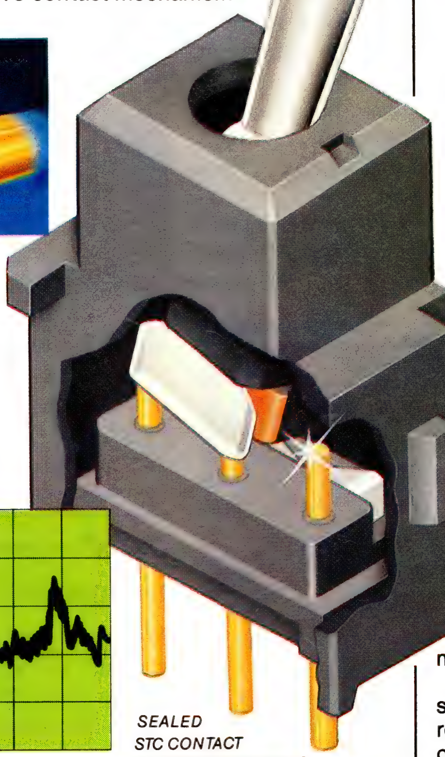
In addition, the unique Sliding Twin Crossbar system provides a back-up, or failsafe, path for current. If one side or "bar" of the movable actuator should fail to conduct, the other is there to make contact.

STC improves "feel" of actuation as well as reliability.



Until now, design engineers have found it difficult to create smooth operating, highly reliable switches within the framework of sliding contact technology. However, by utilizing "round" stationary and common contact points (U.S. Patent No. 4371767), NKK's STC produces an exceptionally smooth operating feel. In fact, traditional non-STC contact mechanisms can cause an ON-NONE-ON condition in what is suppose to be an ON-OFF-ON switch. This possibility is precluded by the sophistication of NKK's STC design.

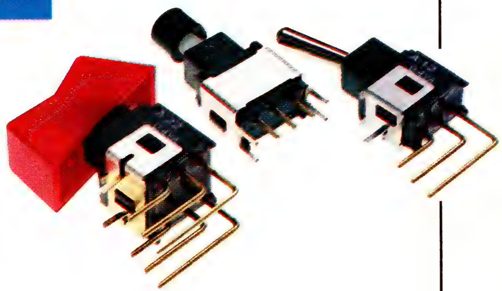
The superior operating action of the STC contact mechanism becomes obvious when an NKK switch is compared to competitive types.



SEALED STC CONTACT ALLOWS TIME-SAVING WAVE SOLDERING AND SAFE WASHING.

STC switches completely washable.

While the contact area of NKK's STC mechanism is cleaned with each wiping action, the rugged sealed-body construction of the switch adds an extra measure of protection against contamination, oxidation and sulfurization. As a result, NKK devices utilizing STC may be subjected to time-and-cost-saving wave-soldering techniques, then washed without fear of compromising their operating characteristics.



NKK STC-actuated toggles, rockers, pushbuttons and slide switches available for immediate shipment.

Choose from single- or double-pole STC switches in a full range of momentary or maintained circuits with ratings of .4VA Max. @ 28V Max. (applicable range: 20 mV ∼ 28V/ 0.1mA ∼ 0.1A). Right-angle, verticle and straight-mounting bracketed or unbracketed terminations are available. Some switches are offered with anti-static bushings. All conform to standard .100 x .100 PC board grid patterns. All are available for immediate shipment exclusively from NKK.

For more information about the STC system and the switches which have revolutionized logic-level reliability, contact NKK: 602/991-0942. TWX 910-950-1167.

IF IT'S NOT NKK, IT'S NOT STC

nkk switches

14415 N. Scottsdale Road, #700 Scottsdale AZ 85260
602/991-0942 TWX 910-950-1167

Circle 91 on reader service card

priced at $1,495 each. Shipments are scheduled to begin at the end of this month.

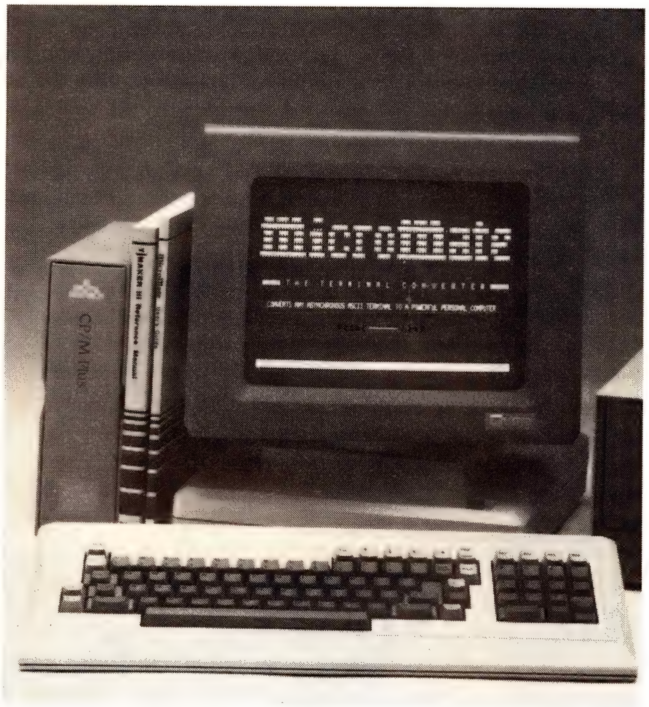
Corona Data Systems Inc., 275 E. Hillcrest Dr., Thousand Oaks, Calif. 91360. Phone (805) 495-5800 [Circle 342]

Hard-disk drive boosts 8-bit computer's performance

By adding a hard-disk drive extension of 10 megabytes expandable to 20 megabytes to the MicroMate computer, the manufacturer believes that performance equivalent to a 16-bit computer can be achieved. The hard-disk drive gives an average access time of 50 ms and a maximum transfer rate of 5 Mb/s.

The MicroMate, an 8-bit machine introduced a year ago, is designed to convert any asynchronous ASCII terminal to a personal computer or to integrate microcomputers into a data-processing system.

With 128-K of random-access memory, the MicroMate uses the 3.0 CP/M Plus operating system from Digital Research Inc. CP/M programs written for the 2.2 operating system will also run without modification.



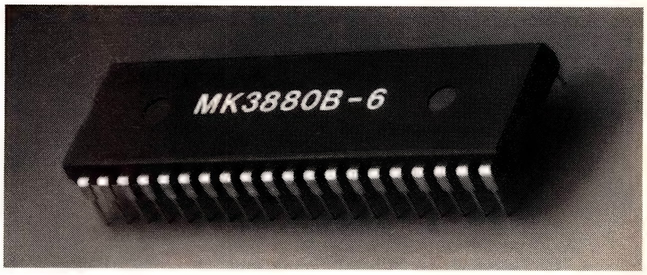
The list price of the MicroMate is $1,295 plus a price of $1,795 for the 10-megabyte hard-disk drive. Volume purchasers may request discounts. Delivery is made from stock.

Personal Micro Computers Inc., 275 Santa Ana Ct., Sunnyvale, Calif. 94086. Phone (408) 737-8444 [Circle 343]

Processor combines 8-bit bus with 32-bit architecture

A microprocessor compatible with 8-, 16-, and 32-bit systems and that targets the small-systems market, the MK 68008 uses an 8-bit data bus to access memory and peripherals. The manufacturer says that this results in lower system costs while preserving the performance benefits of a 32-bit architecture.

The 68008 is source- and object-code-compatible with the same manufacturer's 68000 microprocessor. It features 17 32-bit registers, 56 basic instructions, memory-mapped input/output, and exception processing that the manufacturer calls extensive. Fourteen address modes can be utilized for stacking, queuing, and other programming operations. A linear address space of 1 megabyte allows development and execution of large modular programs without having to adopt an arbitrary segment size.



The MK 68008 is available in a 48-pin plastic package for $19, in 1,000-piece quantities; volume discounts will be given.

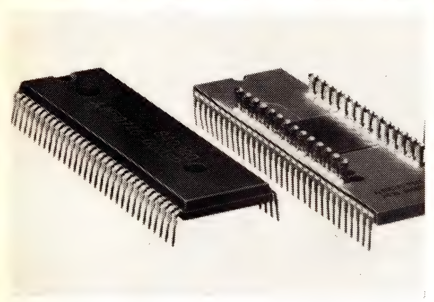
Mostek Corp., 1215 W. Crosby Rd., Carrollton, Texas 75006. Phone (214) 466-6000 [Circle 340]

CMOS microcontroller targets automation, consumer goods

Equipped with features such as on-chip serial input/output, a universal asynchronous receiver/transmitter, analog-to-digital converters, and high-voltage output ports, the MELPS 740 microcontroller line is upward-compatible with the 6502 microprocessor, and offers 3- to 6-K bytes of read-only memory and 64 to 192 bytes of random-access memory.

Previously only available in Japan, the MELPS 740 microcontroller line is called ideal by the manufacturer for applications in office and factory automation, consumer goods, and in products where portability and battery operation are required.

The same development support software that runs on development systems such as Intel's MD/S and the man-



ufacturer's own CP/M-86 can be used to write software for the MELPS 740. In-circuit emulator boards and debugging units are available, as well as piggyback evaluation chips for testing before committing to final ROM code.

Prices for the MELPS 740 line are determined by on-chip memory and features selected. The range is from $4.50 to $7.85 in quantities of 5,000 or more. The ROM masking charge is $1,500, and piggyback devices are available at $200 each. The company is currently accepting orders.

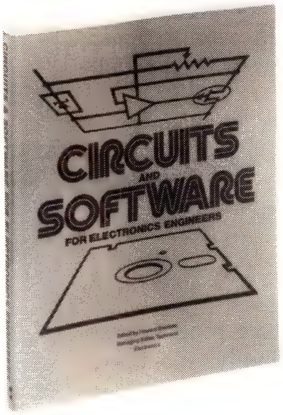
Mitsubishi Electronics America Inc., 777 N. Pastoria Ave., Sunnyvale, Calif. 94086. Phone (408) 730-5900 [Circle 341]

Voice and data station now comes with a CRT

A voice and data work station, the model 300, is now available with a high-resolution cathode-ray tube monitor as an alternative to the 8-by-80-character liquid-crystal display. The monitor and controller have a resolution of 560 by 240 pixels on a 9-in. high-contrast screen. The work station displays characters in nonglare P31 green phosphor.

Other standard features include underline, reverse video on both individual characters or a full screen, normal or bold character display, and a 128-character ASCII set. The freestanding CRT can be placed directly on a desktop or configured with a tilt stand.

Along with a choice of either CRT or LCD screens, the 300 includes a telephone handset and speakerphone, two phone lines capable of voice or data communications, an electronic directory that can store up to 2,000 entries when fully configured, a five-function calculator, full-stroke keyboard, separate numeric keypad,



CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS

Easy, reliable solutions to your design problems!

Covers a vast range of design problems, organized into 25 vital categories by function.

Contains hundreds of circuits and computer programs.

Design appropriate circuitry to meet the most challenging specifications.

Cut design time by adapting proven circuits and software to a wide range of applications.

Save money and increase productivity by avoiding costly design errors.

These creative, new ideas and approaches keep you on top of what's happening in the latest circuitry developments.

ORDER YOUR COPY TODAY! Send $19.95 to:

Electronics Week Books
McGraw-Hill Inc.
Priceton Road
Hightstown, N.J. 08520
(Tel.) 609/426-5070

or

McGraw-Hill Int'l. Pub. Co.
Attn: ECC
McGraw-Hill House
Maidenhead, Berkshire SL6 2QL
England

Ten-day money back guarantee. Allow 4 to 6 weeks for delivery.

Tool kit or tool case, isn't it time you owned a Jensen?

A Jensen tool kit's combination of functional case, exclusive pallet design, and proven selection of professional-quality tools gets work done faster, more efficiently. Its executive appearance gives you pride in your work; gives customers confidence in your service. Assures you of front-door access to the equipment you are charged to maintain. Choose from more than 50 standard models or let us custom-design a kit to match your needs. Write or call for more information or a free catalog.

JENSEN TOOLS INC.
7815 South 46th St., Phoenix, AZ 85040
Phone: 602-968-6241 TWX:910-950-0115

Circle 101 on reader service card

and a power supply. The system, with 32-K bytes of memory expandable to 128-K bytes, uses the 16-bit 8088 microprocessor and stores directory information in 8-K (expandable to 64-K) battery-protected complementary-MOS. Data communication is through an auto-originate and -answer 300-baud modem compatible with the Bell 103 standard.

Available now, the model 300 sells for $1,195.

Ambi Corp., 1033 Washington Blvd., Stamford, Conn. 06901.
Phone (203) 323-9811 [Circle 366]

Miniature controller handles 120 I/O lines

A modular system, the Mini-V-12 miniature programmable controller, meets user needs for flexibility, economy, and simplicity, the manufacturer says. It is targeted at first-time users and for small applications, beginning with a system of 16 input/output lines and reaching up to a 120-line I/O system, as needed.

The Mini-V-12 has a 944-word programming capacity and features 352 internal relays as well as 32 counters and timers, using seven instruction types. Programming is by relay ladder logic, and self-diagnostics are built in. A basic controller system consists of a control module, power module, and programmer, with I/O lines added as required.

Programs can be saved by means of a built-in interface for cassette recorder. An internal battery back-up will retain a program in memory for two years minimum, the manufacturer claims.

The Mini-V-12 mounts on a standard DIN connector or directly in a read-only memory module. Models are available for 115 V ac or 230 V ac.

Ready for shipment in mid-October, the Mini-V-12 with eight inputs and eight outputs sells for $400.

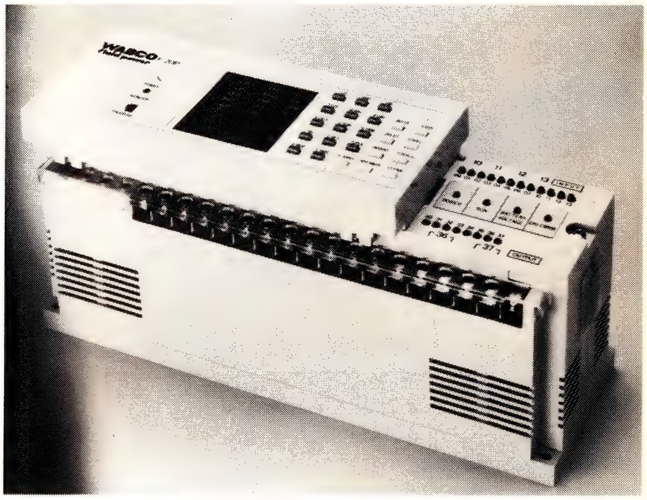
Veeder-Root Co., 70 Sargeant St., Hartford, Conn. 06102.
Phone (203) 527-7201 [Circle 359]

Industrial controllers take on small, medium-sized jobs

In industrial-control applications that require 20 to 80 inputs and outputs, compact programmable controllers are offered for situations where large computer systems are not economical. The F20M and F40M programmable controllers are programmed by means of 14 instructions that use relay or logic symbols, and data can be easily written into or erased from programs, the manufacturer says. Up to 890 words of memory is standard.

All inputs and outputs are physically separate from each other. Units display data with light-emitting-diode indicators. Among the available peripheral equipment are an erasable programmable read-only-memory cassette, program loader, ROM writer, analog timer, remote-control cable, and 10, 20, or 40 input/output expansion units.

The system's power supply comes in two versions: 120-V ac is standard, but the firm also offers a 24-V dc model. The controller includes a lithium battery, which lasts up to five years, in case of power failure.

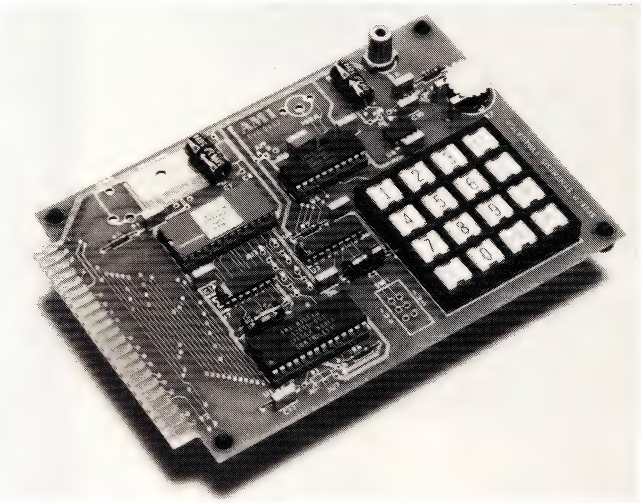


Available now from stocking distributors, the F20M lists for $613 to $721 depending on specifications; the F40M lists for $1,202 to $1,412.

Wabco Fluid Power, 1953 Mercer Rd., Lexington, Ky. 40505.
Phone (606) 254-8031 [Circle 358]

Speech-synthesis chip can be customized

A redesigned version of the S3620 LPC-10 speech synthesizer chip contains a macrocell core that performs speech synthesis using the linear-predictive-coding (LPC) method. (A macrocell is a circuit subsystem that has been designed as a relatively large cell to perform major circuit functions.) This construction, the manufacturer states, allows flexible, economical customization.



Input logic and output amplifier blocks, located on the chip's periphery, can be modified using computer-aided design without affecting the macrocell's speech-synthesis capabilities. The input logic block is a floating end that can be customized to perform various functions.

The manufacturer claims the chip can synthesize high-quality, intelligent speech in male or female voice at low data-storage requirements, typically 1.2 to 2.0 kb/s. Because the output signal is analog, it can drive the loudspeaker directly without external digital-to-analog converters and amplifiers.

Encoded speech data can be stored externally, or read-only memory can be customized to store speech data on the chip's input-logic section. A dedicated speech ROM is also available, as is a library of 307 pre-encoded words and tones.

The 3-μm complementary-MOS S3620 is available now in quantity. Pricing is based on the level of customization required. Without customization, off-the-shelf pricing is $15.40 each in 100-piece quantities. Delivery takes 12 to 14 weeks.

Gould AMI Semiconductors, 3800 Homestead Rd., Santa Clara, Calif. 95051.
Phone (408) 246-0330 [Circle 354]

Software lets Macintosh speak its mind

The first application for SmoothTalker, a text-to-speech software module for microcomputers, is for the Apple Macintosh, with availability on other machines to follow. Implemented entirely in software, SmoothTalker is available either as a module to be incorporated into other software programs or as an end-user's software package.

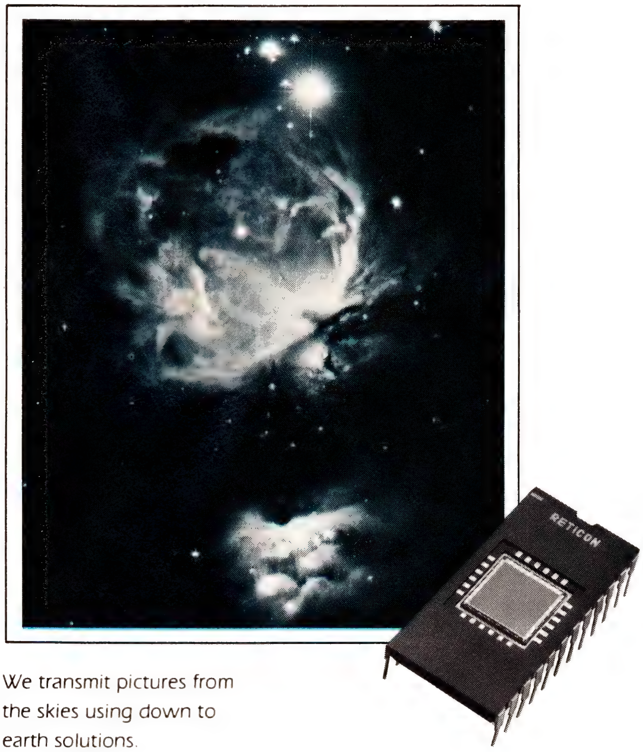
Ordinary English text can be entered from the keyboard or from a text file. It is then synthesized into a male or a female voice, and no external loudspeaker is required for speech. Speed, pitch, volume, and bass and treble tones have nine levels of control each.

SmoothTalker reads such expressions as "$," "@," "Dr.," and "Ms" and speaks them in full. It also understands mathematical symbols. The program can read text files and MacWrite files; in addition, users may create their own defined dictionary.

The retail price of SmoothTalker is $149.95, and shipments are currently being made.

First Byte Inc., 2845 Temple Ave., Long Beach, Calif. 90806.
Phone (213) 595-7006 [Circle 355]

THE PERFECT IMAGE SENSOR



We transmit pictures from the skies using down to earth solutions.

Problem. Your image analyzer design needs to be computer compatible, have high resolution, a wide range of gray scale, be frame resettable with low blooming and zero defects.

The Perfect Solution. Reticon's new 128 x 128 area array. The 128 x 128 will give you the flexibility and quality you need.

Another Perfect Solution. Reticon's new 256 x 256 area array with even more resolution.

With the world's largest selection of image sensors, Reticon leads in quality and reliability.

Call us about your application. We'll be glad to discuss your image sensor requirement - either standard product or custom.

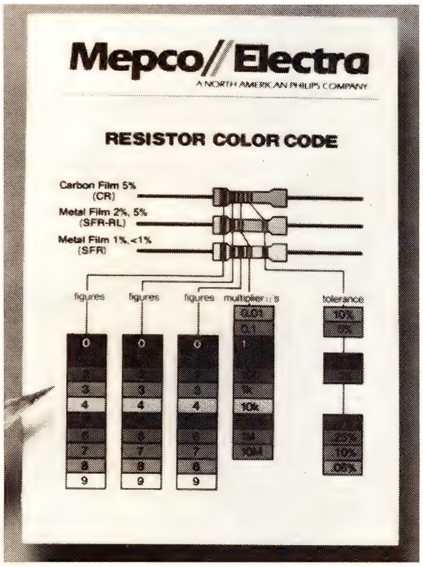
Chicago (312) 640-7713; Boston (617) 745-7400; Japan 03-343-4411; England (0734) 788666; Germany (089) 92692-666. EG&G RETICON CORPORATE HEADQUARTERS 345 Potrero Avenue. Sunnyvale, California 94086-4197; (408) 738-4266 TWX 910-339-9343

EG&G RETICON
WHERE VISION AND TECHNOLOGY MEET

Circle 95 on reader service card

New Literature

Colorful world. A convenient pocket-size chart explains the part marking systems for Mepco/Electra's various resistor products. The four-page chart defines the standard color code as used on most carbon and metal film resistors. It explains the alphanumeric systems used on military-RN-designated, military-established-reliability, and ultraprecision resistors. The chart also includes a table of standard resistance values for the 10-to-100 decade. For free copies, call (201) 539-2000 or write to Mepco/Electra, Columbia Road, Morristown, N.J. 07960. [Circle reader service number 421]



Chip capacitors. *Understanding Chip Capacitors* is a 25-page booklet that describes multilayer ceramic capacitor chips. It covers in detail the electrical properties of capacitors, the various classes of dielectric materials, and the methods of testing electrical parameters. In addition, it answers often-asked questions concerning geometries, terminations, and attachment methods. For a free copy, call (213) 848-4465 or write to Johanson Dielectrics, 2220 Screenland Dr., Burbank, Calif. 91505. [Circle 422]

Testing devices. Covering the various facets of test fixturing for surface-mounted chips and other microelectronic devices, *Introduction to Probing and Handling of Microelectronic Devices* gives the reader pertinent information on the numerous fixturing means used for testing surface-mounted devices, hybrid circuits, and other similar miniature parts.

The illustrated booklet also explains the three stages that must be tested: components, bare boards, and loaded boards. Special requirements such as high-frequency fixturing are covered. Also included is a glossary of technical terms that printed-circuit-board engineers are likely to encounter when working with microelectronic devices. The booklet sells for $2.95 and can be ordered from Inter-Logic Systems Co., 7201-E Garden Grove Blvd., Garden Grove, Calif. 92641.

Plotter notes. Of special interest to users of Versatec's plotter and work station, a quarterly newsletter called *Hard Copy* covers a wide range of plotting, engineering design, and micrographic applications. Articles consist of one or more feature-length application stories, shorter capsule case histories, new hardware and software announcements, and enhancements, convention news, and special features such as plot of the month. For a sample copy and a free subscription, call (408) 988-2800 or write to Versatec, 2710 Walsh Ave., Santa Clara, Calif. 95051. [Circle 426]

Digital source. A 132-page catalog of computer equipment describes Digital Equipment Corp.'s lines from terminals to software and communications products for VAX, PDP-11, and personal computers. Each section provides a detailed description of products, relating them to appropriate application areas and computer systems. The catalog also describes the company's trade-up program for computers and peripherals. For a free copy, write to Digital Equipment Corp., Add-on and Upgrade Group, Continental Boulevard., MK01/W83, Merrimack, N.H. 03054. [Circle 427]

Hybrid notes. A free publication, *An Electrical Design Guide for Users of Hybrid Microcircuits*, highlights hybrid design elements and is geared toward designers of the latest electronic systems. The new guide probes digital and analog circuits, exploring a variety of design, packaging, and implementation considerations. Component selection, circuit partitioning, funneling, derating, and other subjects are covered. The 20-page design guide is available by writing to Teledyne Microelectronics, 12964 Panama St., Los Angeles, Calif. 90066. [Circle 425]

Component chart. Those who repair or design electronic circuits can get a two-sided, two-color, 8-by-11-in. plastic reference card that provides easy access to the basic workings of everything from operational amplifiers to programmable unijunction transistors, without having to go through theory, fabrication methods, or advanced terminology. Micro Chart #10, called Active Electronic Components, covers nondigital functions readily available in a single package, including 13 diode types, 6 types of transistors, 5 families of thyristors, 4 types of light emitters, and 9 types of light receivers. The card also covers analog switches, analog-to-digital and digital-to-analog converters, comparators, multipliers, one-shot, operational amplifiers, optocoupler, bridge rectifiers, sample-and-hold circuits, Schmitt triggers, tone detectors, varistors, voltage-controlled oscillators, voltage regulators, and more. The component reference card is available for $5.95 (plus $1 for postage) from Micro Logic Corp., P.O. Box 174, 100 2nd St., Hackensack, N.J. 07602.

ENGINEERS

Plan for tomorrow

Litton Data Command Systems, a multinational systems engineering company located in the rolling hills of Agoura, offers you the opportunity to find the challenge you've been missing. Our involvement in one of the most extensive defense contracts ever awarded has created the following opportunities:

AIR DEFENSE SYSTEMS ENGINEERS

Desire experience in digital systems design, radar processing, with a background in command and control of air defense weapons and military data link protocols. Experience on TSQ-73, TSQ-51, JSS, TOS, WWMOCS, SHORAD, or related systems is a plus. You will have responsibility for operations analysis, requirements definition for command, control, and communications systems and for systems engineering through development test and integration of systems. BSEE with 10 to 15 years experience or MSEE desired.

COMMUNICATIONS SYSTEM DESIGN ENGINEERS

You will participate in communications system design activities. Responsibilities includedevelopment of block diagram concepts, preparation of specifications, trade-off analysis of alternative concepts, analysis of vendor proposals, preparation of system proposals and technical support to our Business Development personnel and activities. In addition, you will maintain systems engineering responsibility throughout systems development and integration testing.

Requires BSEE or equivalent and at least 10 years background in design of communication systems and hardware. Specific areas of technical experience should include many of the following: Analog transmission; Digital transmission, multiplex techniques, encryption concepts, radio transmission, and telephone switching. Areas of competence should include FDM and TDM, microwave radio and general telephone central office equipment and procedures. Prior background in military systems helpful, familiarity with computer software and operation of desk top mini computers as a design tool is necessary.

We offer a competitive salary, complete company paid benefits including medical, dental and life insurance, and stock purchase plan.

So, if you're interested, send us your resume today.

Professional Employment
P.O. Box 5000, Dept. 629-E1
Agoura Hills, CA 91301-0500
Equal Opportunity Employer M/F/H

DATA COMMAND SYSTEMS
Litton

POSITIONS VACANT

Engineers with Product Ideas — New High-Technology Company in Naples, Florida looking for creative engineers with viable electronic based products to possibly join company and develop product to profitable completion. Prefer medical, telecommunications, or microprocessor application products. Excellent salary/benefits. Send resume and business plan on your idea, if available. All inquiries treated in confidence. Write: P-9892, Electronics Week.

Electronics Supertech design, build for biomed research. Analog AF, RF ckts, mech. skills. Send resume to: Research Service, VA Hospital, 11201 Benton St., Loma Linda, CA 92357.

Engineers — Discreet, Personal, Reputable. National-fee paid. Murkett Assoc., Box 527, Montgomery, AL 36101.

---

cimatel

Invites you to innovate with leaders

intel MHS

CIMATEL a subsidiary of INTEL CORPORATION and
MATRA-HARRIS SEMICONDUCTEURS
based in the Paris-Versailles area
is selecting professionals to create new
VLSI COMPONENTS

Senior Design Engineers & Project Leaders

Lead a team of engineers, layout designers and technicians engaged in the definition and development of VLSI circuits. Help define new members of the INTEL / MHS product line. Design projects include both analog and Digital components. State-of-the art CAD tools are used for high level, logic, electrical and layout design.

Requirements for these positions include an engineering degree, five years of LSI / VLSI design experience, and demonstrated leadership ability. Some analog design experience would be helpful.

Please send your handwritten application, curriculum vitae and photograph to CIMATEL, immeuble «Les Quadrants», 3 avenue du Centre 78182 Saint Quentin en Yvelines Cedex.

POSITIONS VACANT

Technical Service Supervisor — Furane Products Company, a subsidiary of Rohm & Haas Advance Materials Company, is currently looking for a Technical Service Supervisor for our Opto and Dielectric Liquids Products Line. The ideal candidate will have a minimum BS Degree in Organic Chemistry and at least 5 yrs. formulation experience in epoxy and urethane dielectric materials. You must have excellent verbal and written communications skills for interfacing with customers on a technical level. Supervisory experience would be helpful. We offer excellent benefits and a competitive salary. For immediate consideration, please send resume and salary history to: Furane Products Co., 5121 San Fernando Road West, Los Angeles, CA 90039 Attn: Mrs. Bell (818)247-6210.

POSITIONS WANTED

Switching Power Supply Expert for hire. State-of-the-art designs in less time and less expensive. Also consulting. Call for information: G. Perica 514-683-0016.

POSITIONS WANTED

Microprocessor Systems Engineer; design, development & test; for contract work. Earle R. Miller, P.O. Box 2397, R. P. V., CA. 90274. (213)541-9123.

CALL IN YOUR CLASSIFIED ADS

(212) 512-2556

An Alternative for Advertisers to Reach Design Engineers

COMMUNICATIONS SYSTEMS EQUIPMENT DESIGN
NEW!
Premier issue: October 1, 1984

Editorial:

Communications Systems Equipment Design is devoted entirely to international coverage of the communications segment of the electronics industry. It is produced by a team of experienced technical editors dedicated to providing readers with the most complete and accurate technical information available. A typical issue includes detailed technical articles focusing on significant trends or techniques authored by industry experts, provides in-depth technical articles and introduces new products.

Circulation:

25,000 qualified electronic design engineers specifically responsible for the design and manufacture of communicatrion equipment and systems, worldwide.

1984 Special Introductory Rates:

Ad size	ElectronicsWeek advertisers	Non ElectronicsWeek advertisers
1 page:	$1,000	$1,500
2/3 page:	750	1,125
1/2 page:	620	930
1/3 page:	400	600
1/4 page:	320	480
1/6 page:	220	330
Cover rates		
4th cover:	2,160	2,635
3rd cover:	1,710	2,260
2nd cover:	1,810	2,410
Color charges:		
Two color, standard:	305	
Matched 2nd color:	510	
4 color process:	610	
4 color process spread:	950	

Issue and Closing Dates:

Issue dates	Closing Dates
Premier Issue October 1, 1984,	September 13, 1984
December 1, 1984	November 1, 1984

No Waste Circulation:

Communications Systems Equipment Design is a targeted and cost-efficient way to get your advertising read by communications equipment and systems design engineers, worldwide.

For space reservations, call Production Dept.,
McGraw-Hill Electronics Publications,
(212) 512-3140,
1221 Avenue of the Americas,
New York, N.Y. 10020.

Meetings

16th Conference and Exhibition, Information Industry Assn. (IIA, 316 Pennsylvania Ave. S.E., Suite 400, Washington, D.C. 20003), Sheraton Palace, San Francisco, Nov. 11-14.

Second International Conference of Plasma Chemistry and Technology, Research Institute of Plasma Chemistry and Technology and Technomic Publishing Co. (Technomic Publishing Company, 851 New Holland Ave., Box 3535, Lancaster, Pa. 17604), Sheraton Harbor Island East Hotel, San Diego, Nov. 12-13.

11th Computer Security Conference and Exhibition, Computer Security Institute (Carol Smith, CSI, 43 Boston Post Rd., Northborough, Mass. 01532), Hyatt Regency O'Hare, Chicago, Nov. 12-14.

Automation '84, Part II, Semiconductor Equipment and Materials Institute (Lori Savate, SEMI, 625 Ellis St., Suite 212, Mountain View, Calif. 94043), Stanford Holiday Inn, Palo Alto, Nov. 13-14.

Interface I, Society of Manufacturing Engineers, Computer and Automated Systems Association, and American Production and Inventory Control Society (SME, 1 SME Dr., P.O. Box 930, Dearborn, Mich. 48121), Conrad Hilton Hotel, Chicago, Nov. 13-15.

Nepcon Central, American Society of Test Engineers, the Electrical/Electronics Insulation Association and the International Coil Winding Association (Cahners Exposition Group, Cahners Plaza, 1350 E. Touhy Avenue, P.O. Box 5060, Des Plaines, Ill. 60018), O'Hare Exposition Center, Rosemont, Ill., Nov. 13-15.

13th Meeting and Technical Conference, CAM-I, Computer Aided Manufacturing-International Inc. (Rhonda Gerganess, CAM-I, 611 Ryan Plaza Dr., Suite 1107, Arlington, Texas 76011), Sheraton San Key Hotel, Clearwater Beach, Fla., Nov. 13-15.

JINA '84 International Symposium on Antennas, IEEE French Section (Anne Cerboni, CNET/PAB, Centre de la Turbie, 06320 Cap d'Ail, France), Acropolis Convention Center, Nice, France, Nov. 13-15.

Synergy '84: Functional Interfacing for Computer Integrated Manufacturing, American Production and Inventory Control Society and the Society of Manufacturing Engineers (Cheri Williams, SME, 1 SME Dr., Box 930, Dearborn, Mich. 48121), Conrad Hilton Hotel, Chicago, Nov. 13-15

Compec, Computer Peripheral And Small Computer Systems (British Information Services, 845 Third Ave., New York, N.Y. 10022), Olympia, London, Nov. 13-16.

Electronica '84, Kallman Associates (Kallman Associates, 5 Maple Ct., Ridgewood, N.J. 07450), Trade Fair Center, Munich, Nov. 13-17.

ABA Video Banking Symposium, American Bankers Association (Sheldon D. Golub, ABA, 1120 Connecticut Ave. N.W., Washington, D.C. 20036), Hyatt Regency Hotel, Dallas, Nov. 14-16.

Comdex/Fall, The Interface Group (300 First Ave., Needham, Mass. 02194), Las Vegas Convention Center, Las Vegas, Nov. 14-18.

Videotex '84, Online Conferences Limited (Online Conference Limited, Pinner Green House, Ash Hill Dr., Pinner HA5 2AE, Middlesex, UK), The Rai Centre, Amsterdam, Nov. 20-22.

International Exhibition of Electronic Equipment and Products—PRONIC, SDSA, (Mr. Sonet, SDSA, 20 rue Hamelin, F75116, Paris), Porte de Versailles, Nov. 20-23.

China International Microelectronics/Computer Exhibition and Conference, Trade Fair Management Corporation Ltd. (Harry C. Lepinske, American Exhibition Services International Inc., P.O. Box 66373, O'Hare International Airport, Chicago, Ill. 60666), Shanghai, People's Republic of China, Nov. 21-26.

Advertisers Index

September 24, 1984

	Applied Microsystems Corporation	7
	Caddock Electronics	16
	Carley Lamps	33
■	**Chicago Laser Systems**	55
‡	**Computrol**	21
	Data General	1
	Discom	35
	EG&G Recticon	95
■	**Electronic Navigation Industries**	5
	Farichild Digital	33
*	**Ferranti Electronics**	15E
‡	**GE Rental**	83
■	**General Instrument Microelectronics**	44-45
*	**G&H Technology**	16E
‡	**Gilway Technical Lamp**	93
	Hewlett Packard	26-27
	Intel Micro Group	3rd C
	International Robomation Intelligence	86-87
	ITT Intermetal	3
	Jensen Tools & Alloys	93
*	**Matra Harris Semiconductor**	8E-9E
*	**Matsushita Elec. Trading Company**	4E
	Monolithics Memories	79-81
	Mostek Corporation	46-47
‡	**Motorola Corporate**	50-51
	Motorola Incorporated	42A, B
	Motorola Semiconductor	23
*	**Murata Manufacturing Semiconductor**	12E
*	**NEC Electronics Gmbh**	5E
	Neff Instrument Corporation	2nd C
	Nippon Electric Company Ltd.	14-15, 31
	NKK Switches of America	91
	OKI Electric Ind Co.	25
*	**Philips Elcoma**	2E, 3E
	Philips T&M	68, 69
*	**Precision Monolithics**	6E, 7E
*	**Rohde & Schwarz**	21
*	**Siemens AG Munchen**	1E
	Sharp Corporation	56
	Teledyne Crystalonics	85
■	**Teledyne Relays**	37
	Telesis	9
	Test & Measurement Systems (TEAM Systems)	52
	Thomsen Semiconductors	74-75
	Universal Data Systems	4th C
*	**Wandel & Goltermann**	83 11E
	Washington State Industrial	39
	Xebec	10-11
	Yokogawa Hokushin Electric Corporation	89

Classified and employment advertising

Cimatel	97
Hayes Microcomputer Products	70
Litton Data Command Center	97
Naval Underwater Systems Center	76

■ For more information of complete product line see advertisement in the latest Electronics Buyers Guide
* Advertisers in International edition
‡ Advertisers in domestic edition

Advertising Sales Staff

Atlanta, Ga. 30319: Maggie M. Dorvee
4170 Ashford-Dunwoody Road N.E.
[404] 252-0626
Boston, Mass. 02116:
Joanna Henderson
575 Boylston St.
[617] 262-1160
Chicago, Ill. 60611
Betsy A. Otto [312] 751-3739
William J. Higgens III [312] 751-3738
645 North Michigan Avenue
Cleveland, Ohio 44113:
[312] 751-3738
Costa Mesa, Calif. 92626: Larry Goldstein
3001 Red Hill Ave. Bldg. #1 Suite 222
[714] 557-6292

Dallas, Texas 75240: Harry B. Doyle, Jr.
5151 Belt Line Road, Suite 907
[214] 458-2400
Englewood, Co. 80112: Harry B. Doyle, Jr.
7400 South Alton Court Suite 111
[303] 740-4633
Houston, Texas 77040: Harry B. Doyle, Jr.
7600 West Tidwell, Suite 500
[713] 462-0757
Los Angeles, Calif. 90010: Chuck Crowe
3333 Wilshire Blvd.
[213] 480-5210
or [213] 480-5203
New York, N.Y. 10020
Matthew T. Reseska [212] 512-3617
Albert J. Liedel [212] 512-3616
1221 Avenue of the Americas
Palo Alto, Calif. 94303:
Larry Goldstein, Lauren Scott, Lynne Simonfy
1000 Elwell Court, [415] 968-0280
Philadelphia, Pa. 19102: Joseph Milroy
Three Parkway, [215] 496-3800
Pittsburgh, Pa. 15222: Joseph Milroy
Suite 215, 6 Gateway Center, [215] 496-3800
Southfield, Michigan 48075: Betsy A. Otto
4000 Town Center, Suite 770, Tower 2
[313] 352-9760
San Francisco, Calif. 94111:
Larry Goldstein, Lauren Scott, Lynne Simonfy
425 Battery Street
[415] 362-4600

Brussels: Art Scheffer
23 Chaussee de Wavre
Brussels 1040, Belgium
Tel: 513-73-95
Frankfurt/Main: Fritz Krusebecker, Dieter Rothenbach
19 Liebigstrasse, Germany
Tel: 72-01-81
Milan: Savio Pesavento
1 via Baracchini, Italy
Tel: 86-90-656
Paris: Jean - Christian Acis
17 Rue-Georges Bizet, 75116 Paris, France
Tel: 720-33-42
Scandinavia: Andrew Karnig
Finnbodavagen
S-131 31 Nacka
Sweden
Tel. 46-8-440005
Telex: 17951 AKA S
Tokyo: Akio Saijo
McGraw-Hill Publications Overseas Corporation,
Kasumigaseki Building 2-5, 3-chome,
Kasumigaseki, Chiyoda-Ku, Tokyo, Japan
[581] 9811

United Kingdom: Art Scheffer
34 Dover Street, London W1
Tel: 01-493-1451

Business Department

Frederick J. Kostbar
Business Manager/Controller
[212] 512-2627
Leon Irgang
Circulation Manager
[609] 426-5542
Archie Anderson
Director of Marketing Services
[212] 512-6642
Margery D. Sholes
Research Manager
[212] 512-3191
Frances M. Vallone
Marketing Administration Manager
and Reader Service
[212] 512-6058
Thomas M. Egan
Production Director
[212] 512-3140
Carol Gallagher
Production Manager
[212] 512-2045
Betty Preis
Production Manager Domestic
[212] 512-2908
Evelyn Dillon
Production Manager Related Products
[212] 512-2044

Classified and Employment Advertising

[212] 512-2556

Editorial

DOD SHOULD STAY ALERT— EVEN AFTER ELECTIONS

We are encouraged by the military's renewed vigor in checking up on semiconductor quality, as evidenced by recent charges, growing out of equipment failures, leveled at Texas Instruments, Hughes Aircraft, National Semiconductor, and others. The harvest of such scrutiny will be a higher level of reliability in the circuits and, as a natural result, in the end products, for all buyers of U.S.-made semiconductors.

Still, the timing of the Defense Department's stepped-up vigilance is curious. With the presidential election less than two months away, it is interesting to note that the Democrats have been using the Administration's military budget—and particularly the waste within it—as a big gun in their attempt to win the White House. The Administration is being well served by the new toughness at the DOD—coincidence or not—because it eliminates, or at least reduces, the opportunity for the Democrats to make military-waste charges.

From here, the timing appears just a bit too cozy: the Pentagon ought to be this cautious as a matter of course. Be that as it may, it is imperative that the Department of Defense continue its inspections and investigations with equal vigilance no matter what the outcome on Nov. 6.

Reliability and quality questions have loomed too long over the U.S. electronics industry. It is clear that more diligence—from specification writing to the testing of final parts—is in everyone's best interest. But such problems are solved in the plant, not on the political platform.

IT'S UP TO EXPORTERS TO POLICE THEMSELVES

The federal bureaucracy, it turns out, is not deaf. Last week the Department of Commerce indicated that it has heard the cries of pain from some 250 U.S. companies, numerous trade associations, and a number of foreign governments and decided to back off on some of its proposed new export licensing rules (only a cynic would point out that this is an election year). The tough regulations were designed to halt the flow of high technology to the Soviet Union.

The regulations, which are expected to go into effect in January, now provide for more self-policing. The originals, put out for comment last January, would have required what companies criticized as a great deal more reporting and other paperwork that would have given less-hamstrung foreign firms an edge.

Significantly missing from the revised rules is one that was considered particularly noxious by U.S. companies: that recipients of U.S. goods list the names and addresses of all customers that might receive them. It was pointed out that this would make the Commerce Department the holder of 1 million new names.

Having won this signal victory for common sense, the protesting U.S. parties had better do a good job of keeping an eye on their exports after they leave the loading dock. If they don't, they won't have much of an argument the next time someone decides to tighten the leash on overseas shipments.

I^{2}ICE™ HELPS SMALL AND LARGE COMPANIES COME OUT SMELLING LIKE A ROSE.

Getting an advanced technology product to market is no bed of roses. It's a path strewn with thorns, and you've got to race your competition through it.

Intel's I^{2}ICE™ software development tool helps.

It's just one of a complete set of development tools that include high level debuggers and compilers, emulators, multiuser networks and program management systems. These tools support the most sophisticated microprocessor in the world, the 80286, as well as all of Intel's other microprocessors and microcontrollers (80186, 80188, 8086, 8088, 8051 and 8096).

Intel's development tools reduce system design risk because everything works together, so you don't have to spend all your time trying to mix and match tools from other suppliers. Engineer productivity is maximized. And products get out the door sooner.

For the complete story, call us at (800) 538-1876; in California, (800) 672-1833. Or write Intel, Lit. Dept. #D11, 3065 Bowers Ave., Santa Clara, CA 95051.

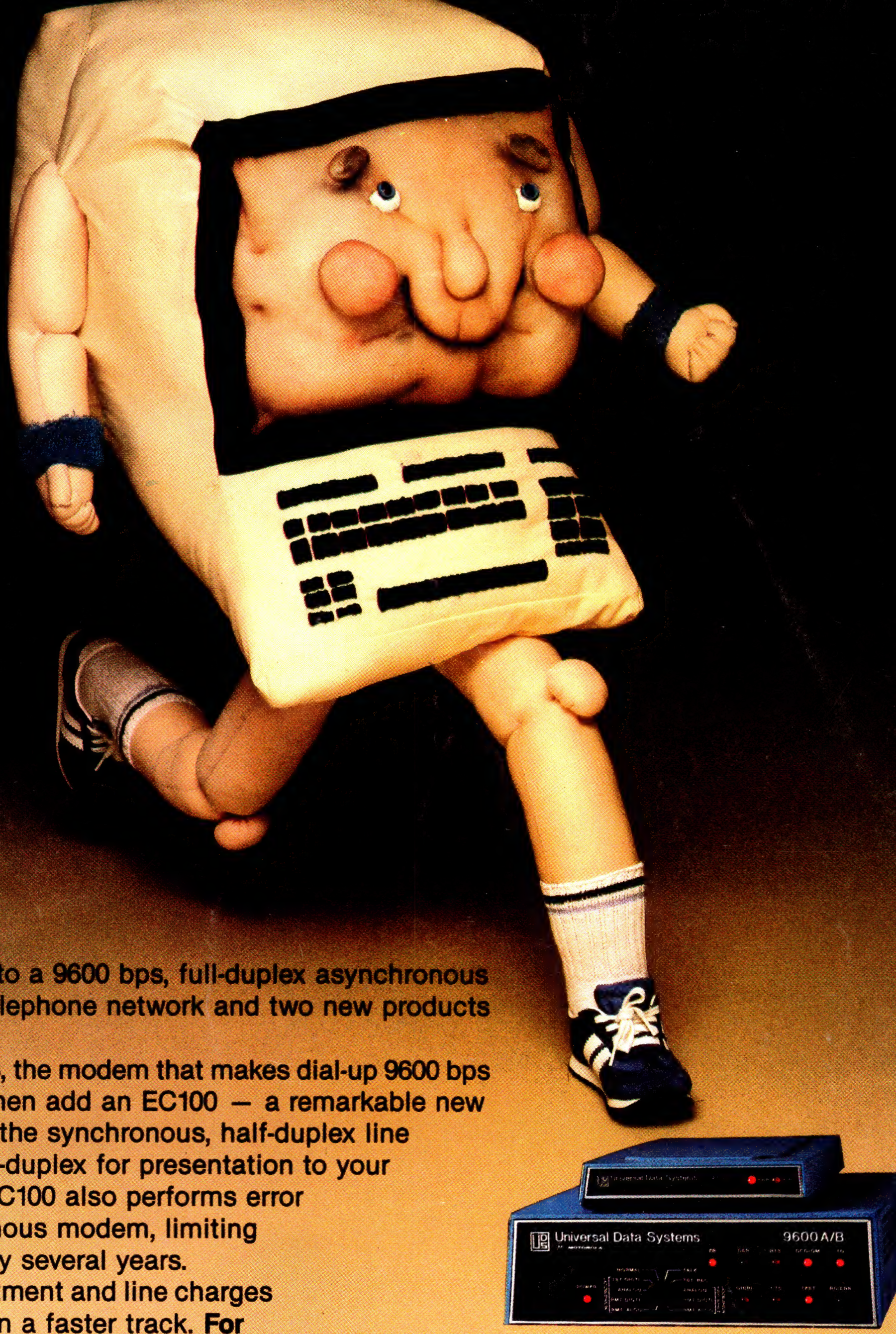
So whether you're a small or large company, you can be sure your new product will have a chance to blossom.

intel®

© 1984 Intel Corporation

Circle 901 on reader service card

Make your dumb terminal run circles around more expensive equipment



Turn your dumb terminal into a 9600 bps, full-duplex asynchronous genius, using the dial-up telephone network and two new products from UDS.

Start with a UDS 9600 A/B, the modem that makes dial-up 9600 bps communication a reality. Then add an EC100 — a remarkable new UDS product that converts the synchronous, half-duplex line signal to asynchronous full-duplex for presentation to your terminal. As a bonus, the EC100 also performs error correction for any synchronous modem, limiting message errors to one every several years.

Save on equipment investment and line charges by putting your terminals on a faster track. **For details, phone 800/633-2252, ext. 356.** Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35805. Telephone 205/837-8100; TWX 810-726-2100.

Universal Data Systems

MOTOROLA INC.
Information Systems Group

UDS modems are offered nationally by leading distributors. Call the nearest UDS office for distributor listings in your area.

DISTRICT OFFICES: **Atlanta**, GA, 404/998-2715 • **Bellevue**, WA 206/455-4429 • **Blue Bell**, PA 215/643-2336 • **Boston**, MA, 617/875-8868 • **Columbus**, OH, 614/895-3025 • **Englewood**, CO, 303/694-6043 • **Glenview**, IL, 312/998-8180 • **Houston**, TX, 713/988-5506 • **Huntsville**, AL, 205/837-8100 • **Mountain View**, CA, 415/969-3323 • **Old Bridge**, NJ, 201/251-9090 • **Richardson**, TX, 214/680-0002 • **Silver Spring**, MD, 301/587-0166 • **Tampa**, FL, 813/684-0615 • **Tustin**, CA, 714/669-8001

Circle 902 on reader service card

Created by Dayner/Hall, Inc., Winter Park, FL